HEALTH ASPECTS OF PESTICIDES

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ENVIRONMENTAL PROTECTION AGENCY

ENVIRONMENTAL PROTECTION AGENCY
OFFICE OF PESTICIDES PROGRAMS

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HEALTH ASPECTS OF PESTICIDES ABSTRACT BULLETIN is a monthly publication of the Division of Pesticide Community Studies of the Environmental Protection Agency.

The purpose of this publication is to foster current awareness of the major worldwide literature pertaining to the effects of pesticides on humans. The publication represents a monthly review of more than 500 domestic and foreign journals. Subjects and authors of abstracted articles are cross-referenced in an annual index issue. Reprint requests should be directed to the author of the complete article.

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CONTENTS

Vol. 5 March 1972 No. 3

Page

General 97

Monitoring and Residues 102

Epidemiology, Prevention and Treatment 115

Toxicology and Pharmacology 126

Analysis 140

Quarterly Index (Jan.–March)
Preface i
Subject Index
I. Compounds ii
II. Concepts xli
Author Index
I. Personal xcvi
II. Corporate cviii

ERRATUM

HAPAB 5(2), February 1972, p. 54:

The citation as previously listed was incomplete. Correction is as follows:

72-0255. Verbeek, M. M. (Coronel Laboratorium voor Arbeidshygiene, Universiteit van Amsterdam, Amsterdam, The Netherlands). **Chemische mutagenen, een gevaar voor de bevolking? [Do chemical mutagens constitute a danger to the population?]** *Tijdschr. Soc. Geneesk. 49(20): 704-705; 1971.* (1 reference) (Dutch)

72-0423. Jukes, T. H. (Dept. of Medical Physics, U. of California, Berkeley, CA). **DDT, human health and the environment.** *Environ. Aff. 1(3): 534-561; 1971.* (65 references)

Some of the evidence is evaluated for support of an intensive campaign to ban the insecticide DDT from the use in, manufacture in, and export from the United States. Organizations most active in the movement to ban DDT are the National Audubon Society, the National Geographic Society, and the Sierra Club. However, it is shown that the withdrawal of DDT would mean the interruption of most malarial programs throughout the world since DDT has been the main weapon in the world-wide malaria eradication programs. With respect to toxicology, the WHO-FAO has established a "permissible rate" for DDT in human milk which offers a safety factor of about 25 compared with what workers in a DDT manufacturing plant have tolerated for 19 years without any detectable clinical effect. The safety factor of the WHO-FAO permissible rate is 150 compared to the dosage given daily for 6 months to a patient with congenital unconjugated jaundice without producing any side effects. It is also stated that DDT is blamed for much damage to wildlife and the natural environment when other substances are, in fact, responsible. The author condemns the "eco-tactics" which are calculated to alarm the public and set up an anxiety neurosis in the population against the use of DDT. Banning the use, sale, manufacture, or distribution in the United States of DDT would permanently polarize agriculture and conservation to such extent that rational solution to their common problems would no longer be possible.

72-0424. Westing, A. H. (Biology Dept., Windham Coll., VT). **Herbicides as agents of chemical warfare: their impact in relation to the Geneva Protocol of 1925.** *Environ. Aff. 1(3): 578-586; 1971.* (30 references)

The contention that herbicides should be construed as prohibited by the Geneva Protocol of 1925 is supported by a review of their effects on the ecosystems to which they are applied and on the human population inhabiting treated areas, with particular reference to tropical regions. Applications to tropical upland forests and tropical tidal forests in Vietnam in order to destroy cover and restrict the enemy's food supply cannot be reasonably compared with domestic and other civil herbicide experience due to the difference in magnitudes involved. Application to tropical upland forests results in invasion of economically and ecologically inferior plants, with the possibility of reforestation within a few decades. Regional fauna may be destroyed either by restriction of food and shelter or by direct herbicide toxicity. In the case of a tropical tidal forest, the vegetation is completely destroyed by herbicide application, and its ability to recolonize the area is enduringly inhibited. The habitats of aquatic animals are destroyed, and coastlines exposed to erosion. Chemicals are deemed unsuitable as weapons because it is the civil populations who bear the brunt of application, and because the ecological and public-health ramifications are unpredictable.

72-0425. Dewey, J. E.; Pendleton, R. F. (Chemicals-Pesticides Program, Cornell U., Ithaca, NY). **Regulations governing industrial weed and brush control in the Northeast.** *Proc. Northeast. Weed Sci. Soc. 25: 348-358; 1971.*

A summary is presented of regulations relating to the application of herbicides for industrial weed and brush control in the northeastern United States. The regulations are first summarized by state, then by common names of the major herbicides. The latter summary includes sections on federal registration and labeled uses, federal limitations, state limitations and "notes", which contains such information as acute oral LD50, persistence data and specialized uses.

72-0426. McCutchen, L. R. (Dow Chem. Co., Midland, MI). **Public relations and the industrial vegetation control worker.** *Proc. Northeast. Weed Sci. Soc. 25: 377-380; 1971.*

Public relations on the part of the industrial vegetation control worker primarily require that the worker be well-informed about all aspects of what he is doing, and willing to have honest discussions with the public. He must feel assured that the compound which he is applying has been thoroughly and conscientiously evaluated before being marketed, and that its application will produce numerous proximate and ultimate benefits to the public. Anticipation of possible adverse responses and use of favorable advance publicity, or tailoring application programs to local sensitivities, may forestall protests. Sources of background information are suggested.

72-0427. Klitsch, F. E. (Alpine Acres, Inc., Wellesley Hills, MA). **Thirty-five years behind the gun, one year on the firing line!** *Proc. Northeast. Weed Sci. Soc. 25: 391-394; 1971.*

Public awareness of instances of improper pesticide use creates the demand for increasingly severe restrictions. Therefore, it is in the interest of the weed control concern not only to create public goodwill, but also to make sure, by hiring thoroughly trained and qualified personnel, that untoward incidents do not take place. Also needed are a better-regulated system for disposal of empty pesticide containers and adequate insurance protection for pesticide applicators at all levels.

72-0428. Anonymous. **The Texas law: bench mark in pest control legislation.** *Pest Control 39(11): 18-21; 1971.*

A copy of the primary section of the pioneering new Texas structural pest control law is presented. The

law defines those persons who are engaged in the business of structural pest control, as well as those who are exempt. It establishes a Texas Structural Pest Control board, its duties, funding and powers. A licensing program and revocation procedures are outlined.

72-0429. Becker, K. (Institut fuer Wasser-, Boden- und Lufthygiene, Berlin-Dahlem, 1 Berlin 33, Corrensplatz 1, Germany). **Zu: Koennen Haustiere mit Cumarin vergiftet werden? [Comment on the article: Can domestic animals be poisoned with coumarin?]** *Prakt. Schaedlingsbekaempf. 23(9): 128; 1971.* (German)

The author wishes to correct an error which he made in the article referred to in the title (this journal, *23(4): 36-6; 1971;* for an abstract see 71-2617). The LD50 value of 60 mg/kg p.o. given for coumarin is obsolete; the value used today is 14-20 mg/kg. A corrected version of Table 1 is presented. This error is important not only in its own right, but for the incorrect impression which it gives, that coumatetralyl is three times more toxic than warfarin. The large-scale rodenticidal campaigns carried out without adverse effects in man and desirable animals, in the United States as well as Germany, emphasize the practical safety of coumatetralyl.

72-0430. Anonymous. **Scientists show indexes of pollution.** *Chem. Eng. News 49(40): 17; 1971.*

Results of some attempts to quantify environmental dangers and assign priorities for allocation of resources were presented at the meeting of the American Association for the Advancement of Science in Philadelphia, January 1972. A rating scale according to the sources of environmental stresses, developed by Dr. Howard Reiquam of Battelle Memorial Institute, and based on a product of persistence times range times inter-system complexity, placed pesticides at the top of the list for the present, followed at some distance by the heavy metals. In the future, pesticides are anticipated to drop to a low priority (for reasons unexplained in this article), while the heavy metals will remain significant. Other scales presented, rate the significance of air pollution sources, accounting for toxic or unpleasant properties as well as total weight; and provide an overall index of environmental quality, scoring various segments such as air, water, living space etc. A general water quality index is in preparation.

72-0431. Sterling, T. D. (Dept. of Applied Mathematics and Computer Science, Washington U., St. Louis, MO 63130). **Difficulty of evaluating the toxicity and teratogenicity of 2,4,5-T from existing animal experiments.** *Science 174(4016): 1358-1359; 1971.* (26 references)

Attempts to resolve the question of toxicity of 2,4,5-T with the aid of animal experiments have provided uncertain results. In this report, it is suggested that this is the result of gross inadequacy of experimental data and their analysis. All of the experiments cited were designed to test the effect of 2,4,5-T at relatively high doses on relatively small numbers of animals. The statistical analyses were very simplistic and failed to account for such elementary factors as nonnormal distributions, or to question the assumptions involved in the extrapolations of dose-effect curves. It is suggested that the powerful statistical tools which are now available should be employed in assessing questions of such fundamental importance to the human race, and that the potentialities of animal experiments be further questioned.

72-0432. Hammond, A. L. (Author address not given). **Chemical pollution: polychlorinated biphenyls.** *Science 175(4018): 155-156; 1972.*

Production in the United States of polychlorinated biphenyls (PCBs), widely used as industrial chemicals, amounted to 2.5 million gallons in 1961. They are similar to DDT in that they degrade slowly in the environment and tend to accumulate in the food chain. At the present time there is little epidemiological information about PCBs effects on man. In many areas residues in fish and birds are equivalent to that for DDT. Preliminary data from a nationwide monitoring program being coordinated by the Environmental Protection Agency show that 33% of more than 600 samples of human adipose tissue contained PCB residues of at least 1 ppm. Officials of the Food and Drug Administration characterize PCBs as a "potential but not immediate health hazard", and claim, on the basis of their monitoring programs, that except for his eating of fish the American consumer receives no systematic exposure to PCBs. Biological actions of PCBs inside the body are relatively unknown. They have been shown to alter liver tissue, inhibit the growth of culture cells, and affect a variety of enzyme systems, but the mechanism of action is still uncertain. Much of the research of PCBs has pointed to the similarily of PCBs and DDT and other chlorinated pesticides; non-toxic amounts of PCBs in insects increased the toxicity of DDT and some organophosphate pesticides by as much as 100%. The presence and persistence of PCBs in the environment emphasize the likelihood that any widely used industrial chemical may become an environmental pollutant, and increase the responsibility for public disclosure of production quantities and use patterns when similar situations occur in the future.

72-0433. Anonymous. **PCB: going the way of DDT.** *Med. World News 12(39): 6; 1971.*

Polychlorinated biphenyl (PCB) is similar to DDT in its persistence in the environment and its accumulation in the tissue; PCB is also mutagenic and pathogenic. Residues of PCB have been found in salmon and trout from Lake Michigan and have also been detected in turkeys, chickens, eggs, West Coast salmon and fish

meal. The FDA does not see a need for a complete ban; nevertheless, it is surveying packaged foods for possible PCB contamination. Regardless of the present survey, 30 million lb of DDT will be used this year.

72-0434. Bergmann, E. D. (Author address not given). **The future of insect control—a problem of human environment.** *Chem. Tech. 1(12): 740-744; 1971.*

New practical approaches to insect control are discussed which are specific for insect species and which do not affect higher animals. One method suggested is to follow the basic premise of chemotherapy: to find in the insect a biochemical pathway or a compound that is essential to the insect but which is not found in higher animals. A proper drug selection would inhibit this pathway or interfere with the activity of the compound. Another method discussed is insect sterilization, either by ionizing radiation or by chemosterilants. Recent evidence has shown that the use of both sterile sexes is sometimes superior to the release of the sterile males alone. More information is needed on insect spermatogenesis and oogenesis. Another species-specific potential method of insect control is the use of sex attractants. This method is more selective than sterilization. These sex attractant compounds could be used practically to concentrate the insect population from a fairly large area and then to destroy it. Formulas for some known chemosterilants and sex attractants are given. One factor which all of the proposed methods have in common is that they will increase the cost for the solution of environmental problems.

72-0435. Anonymous. **Roundup of pesticides for 1971.** *Amer. Fruit Grower 91(2): 15-16,40; 1971.*

An annual report by the *American Fruit Grower* lists new pesticide products and new clearances or revised tolerances for established pesticides. Insecticides covered include Carzol SP (formetanate hydrochloride), Cygon 267 (dimethoate), Cythion (malathion), Fundal SP (chlordimeform), Gardona, Guthion 50% WP (azinphos-methyl), Imidan, methoxychlor, Mytrol, Omite, Phosvel, Plictran (tricyclohexyltin hydroxide), Torak, Zolone EC, and Zolone WP (Phosalone). Fungicides include Cosanil (zineb, sulfur and copper), Cyprex 65-W (dodine), Difolatan 4 Flowable (captafol), Mertect (thiabendazole), Supercosan (sulfur, micronized), and Thynon (dithianon). Herbicides and soil fumigants include Mor-Cran (naptalam), Planavin 4 WDL (nitralin), Rotox, VCS-438, and Zytox. Growth regulators include Alar and Acti-Acid (cycloheximide). The manufacturer is given for each compound. In addition there are a brief set of rules which pesticides users should always follow when handling or using these products. It is emphasized that users should read thoroughly and understand the labels before purchase of the chemicals.

72-0436. Charvat, J. (Lab. for Endocrinology and Metabolism of the Medical School of Charles U., Prague, Czechoslovakia). **Chorobne stavy vyvolane zevnim prostredim. [Diseases induced by the environment.]** *Prakt. Lek. 51(20): 753-756; 1971.* (9 references) (Czech)

Of man-made environmental pollutants which cause or trigger or contribute to the aggravation of extant diseases, DDT and other chlorinated hydrocarbons are perhaps the most important next to pollutants emitted by industry and by automobiles. The danger of these pesticides is in their stability. DDT from dusting or spraying operations penetrates into underground and flowing waters to end up undecomposed in oceans. It attaches itself to lipids in living organisms and its storage in the ecological pyramid snowballs. A few parts of DDT per billion block photosynthesis and phytoplankton is therefore most affected. Those carnivores who live longest accumulate the greatest amounts of DDT. Not all species are equally susceptible. Some bird species have disappeared either directly through the toxic effect of DDT or through its interference with reproduction (soft-shelled eggs). All humans by now have DDT in their body fat, sucklings acquire it through the milk of their mothers. Hitherto no proof exists that it is harmful to humans. Even if DDT was banned immediately its accumulation in the trophic pyramid would continue for decades; there is no known mechanism that would decompose DDT in nature as fast as it is being supplied. Recently the observation was made that polychlorinated biphenyls, while not directly detrimental to wild ducklings, render them more susceptible to the duck hepatitis virus.

72-0437. Sugimoto, Y. (Staff Writer, Chemical Economy & Engineering Review, Tokyo, Japan). **Trends in agricultural chemicals production.** *Chem. Econ. & Eng. Rev. 4(1): 36-39; 1972.*

Trends in agricultural chemicals demand in Japan are reviewed and compared with that of the United States. Japan has completely prohibited the use of DDT, BHC, and the "drin" compounds, whereas in the United States these compounds are not totally banned. Demand for agricultural chemicals in Japan is 41% insecticides, 26% herbicides, 22% fungicides, and 11% other chemicals. Corresponding figures for U. S. are 53%, 32%, 13%, and 2%. The demand for fungicides is higher in Japan because the humidity is higher. Costs for development of new pesticides are high because they must be tested for acute and chronic toxicity, teratogenicity, mutagenicity, genetic effects, and cancer-inducing properties. At least eight years are required to develop and bring a new product to the marketing stage. The cost is estimated to be 4,000 million yen. Even in the U. S., there is hardly a sufficient demand to justify such a large investment. Eleven Japanese companies are listed which are attempting to cope with the harsh economical aspects of pesticides research and development, together with brief description of their new products.

72-0438. Herfs, W. (Biologischen Bundesanstalt fuer Land- und Forstwirtschaft, Institut fuer Pflanzenschutzmittelpruefung, Braunschweig, Germany). **Neuregelung zur Pruefung und Zulassung von Pflanzenschutzmitteln unter besonderer Berueckksichtigung des Vorratsschutzes. [New legislation for testing and admission of pesticides taking into account agents for protection of stored products.]** *Anz. Schaedlingsk. Pflanzenschutz 44(6): 81-84; 1971.* (14 references) (German)

On May 10, 1968, the "Plant Protection Law" brought into effect new regulations concerning the admission of pesticides into the Federal Republic of Germany. These laws are to protect the employer, the consumer, and the environment. The changes in the new regulations, "The Plant Protection Cost Law" of August 26, 1969, concerning the testing and admission of pesticides are discussed and compared with the older law. A simplification of testing methods is anticipated and modes of application improved upon.

72-0439. Anonymous. **Dossier du dichlorodiphenyltrichloroethane. [The file on dichlorodiphenyltrichloroethane.]** *Phytoma 230: 39-46; 1971.* (French)

The situation concerning DDT problems is described as of late 1970. The international drive to ban DDT originated in Sweden where DDT was used in small quantity. The materials furnished by international laboratories assigned by WHO to investigate DDT-related problems cannot yet serve as a basis for decisions. New limitations imposed on DDT employment in various countries are reviewed. In the USA, use of DDT is permitted for cotton and citrus fruits. Now, a total ban is being considered. Tolerances for DDT and BHC in foodstuffs are 1.25 and 0 ppm, respectively. Upon a suggestion by the U.S. Food and Drug Administration, the above values for DDT will be reduced to 0.5 on 29 products and 1 ppm on certain vegetables, in certain plants, beginning Jan. 1, 1972. Risks involved in DDT are no problem in France as the consumption dropped to less than 300 tons in 1970. DDT is indispensable in some cases, but in others, use should be limited. As of April 1971, DDT is banned in rice plantations in Japan. The ban of DDT is also considered in German Federal Republic. The unabridged text of Feb. 1971 WHO communique dealing with DDT, health, and environment is published. In malaria-stricken areas, DDT is of great importance. Arguments for and against DDT are enumerated. While DDT represents minimum risk for man, exterior application should still be minimized. Indoor application is less harmful. Research is required to develop materials able to replace DDT. Citations from June 1971 number of *UNESCO Courrier* reveal the positive role DDT plays in the role against famine.

72-0440. Martin, N. (Author address not given). **Les intoxications par les insecticides organochlores *[sic]*. [Poisoning by organochlorine *[sic]* pesticides.]** *Phytoma 230: 49; 1971.* (French)

The 6th National Symposium on Agricultural Medicine held in May, 1971, in Paris, was concerned with poisoning by organophosphorus pesticides. Lectures delivered here are enumerated. Such pesticides have been in massive use since World War II to control malaria, certain parasites and insects. Poisoning risks occur chiefly in production and application. Organophosphorus pesticides inhibit cholinesterase and cause different symptoms in humans depending on the nature of contact. First aid resides in the elimination of the poison. Medical treatment, including the administration of drugs, is necessary. Instructions and hygienic regulations should be observed in production and application, and regular cholinesterase analyses should be performed on employees handling such products.

72-0441. Yoshida, M. (National Hygienic Experimental Test Lab. Tokyo, Japan). **[Pollution of milk by agricultural chemicals.]** *Shoku No Kagaku (Food Science), 3: 66-72; 1971.* (Japanese)

According to the statistics between 1960 and 1969, accidental deaths caused by pesticides ranged from 39 to 50 per year; pesticide poisoning from 214 to 900 per year, and the use of pesticides for murder and suicide ranged from 790 to 917 per year. Together with Italy and Israel, Japan shows the highest per-square area usage of agricultural chemicals in the world. As in the case of Italy, the Japanese use a limited amount of DDT and a relatively large quantity of BHC. The residual effects of DDT investigated in the United States are briefly discussed. With regards to BHC, a Japanese scientist has reported that α-BHC and γ-BHC, the main components of BHC, quickly dissolve in soil and more than 60% of BHC in soil comprises β-BHC, and that the residual composition in milk is 23% α-BHC and 70% β-BHC. When consumed, β-BHC is absorbed in the fatty tissues of the body and does not decrease, eventually increasing to 95% of residual BHC in human body. The chronic toxicity of β-BHC is well known. The use of BHC has been forbidden by law since May 1, 1971, except for against specific insects harming trees other than fruit trees. Aldrin, endrin, and dieldrin, which have been used previously as insecticides for fruit trees and vegetables, have also been forbidden by the same law except for the use against insects harming tree trunks, branches and roots separated (dug out) from the soil. The use of endrin is prohibited except for the citrus trees before bearing fruit. By the provisional regulations issued by the Government Environmental Agency (before the final laws are passed) on June 15, 1971, the maximum permissible residue of β-BHC in milk is 0.2 ppm, DDT is 0.05 ppm, and dieldrin is 0.005 ppm. The body fluid of a cow and various intestinal bacteria partially decompose agricultural chemicals which circulate in blood and deposit in the fat tissues until an equilibrium is reached

between the amount of chemicals in the blood and the amount of deposition in the fatty tissues. Decomposition of organochlorines is relatively slow, and excretion through urine is limited. Therefore, the cow secretes the chemicals into the milk. The quantity of human intake of organochlorines through milk and dairy products depends on the diet of the people. In the United States and in England, it is said to be 1/5 of total food consumption. It is estimated to be lower than this amount in Japan.

72-0442. Grasso, T. (Montecatini Edison, Centro Sviluppo Antiparassitari, V. Bonfadini 148, Milan, Italy). **The regulation of pesticides in Mexico.** *Residue Rev. 40: 133-152; 1971.*

Regulations governing pesticide production in Mexico are currently undergoing review, with a view toward promulgating more specific legislation in the near future. The current regulations begin with the Act of August 29, 1940, which supports the production of pesticides for promotion of agriculture in Mexico. Tables show Mexican pesticide production and importation figures. The regulation of July 22, 1942, defines pesticides and herbicides, and requires authorization by the Ministry of Agriculture prior to sale. Labeling and analytical requirements are also specified. "Circular No. 6" of June 9, 1967, and the Act of April 29, 1968, constitute steps taken toward updating Mexican pesticide regulations. In the first, zero tolerances are set for endrin in many crops, and restricted use permitted on others. The latter act deals more specifically with safe storage, transportation, packaging and labeling of pesticides. Points are suggested for inclusion in the new bill.

72-0443. Ravina, A. (Paris, France). **L'Homme moderne et la nature. [Modern man and nature.]** *Presse Med. 79(12): 533-536; 1971.* (French)

Industrialization and rapid urbanization have forced a considerable part of the population to live under less than hygienic conditions. Adverse effects of civilization are also being felt in rural areas as present-day mankind exercises an important influence on the complex phenomena of nature. European Ministers of Agriculture have been concerned with water pollution problems in early 1971. World DDT consumption presently totals 300,000 tons yearly. It is a non-selective pesticide of long-lasting effect showing high local concentrations in diverse areas, and capable of polluting waters and of accumulating in living organisms. It has, however, the advantage of being cheap and easily applicable. WHO is calling for the replacement of DDT and similar products in malaria control and other areas because of the immunity of certain insect orders. Arguments for and against DDT and other pesticides are cited. Pesticides are necessary to secure existence of man and civilization, but also the equilibrium in nature is to be maintained. A possible way to do so, in spite of demographic expansion and rapid industrialization might well be the creation of reservation areas.

72-0444. Anonymous. **The PCB story unfolds.** *Food Cosmet. Toxicol. 9(4): 568-571; 1971.* (15 references)

Recent developments in the study of environmental effects of polychlorinated biphenyls (PCBs) are reviewed. Following the discovery that PCBs may increase the toxicity of pesticides, their exclusion from pesticide formulations was requested. Their resemblance to the organochlorine pesticides, as well as the fact that they are sold as complex mixtures, makes it difficult to assess their effects on growth, mortality and reproduction. Lesions resembling those produced by chick edema factor were shown to be due to a contaminant, chlorinated dibenzofurans, present in some commercial PCBs. Residue studies in birds revealed maximum concentrations in those birds which eat freshwater fish. The dose-effect curve in bird mortality studies was found to be shallow. The fact that the PCBs induce microsomal liver enzymes suggests a possible involvement in bird breeding failures. PCBs were found to enter marine and terrestrian food chains via sewage sludge dumped in the ocean or spread on land. Direct entry into foodstuffs from treated containers was also noted.

72-0445. Epstein, S. S.; Legator, M. S. (Harvard Medical School and Children's Cancer Research Foundation Inc., Boston, MA). **The Mutagenicity of Pesticides: Concepts and Evaluation.** *The MIT Press, Cambridge, 1971. xvii, 220 p.* (579 references)

This research is based on the "Report of the Advisory Panel on Mutagenicity of Pesticides to the Secretary's Commission on Pesticides and Their Relationship to Environmental Health". Internationally recognized authorities in chemical mutagenesis, mutagenicity testing, and toxicology formed the Panel. This report includes tabulations, cross index of 370 pesticides listed by common names and synonyms, chemical name and formula, major uses and manufacturers. A literature review on mutagenicity of pesticides is also contained which includes the name of the pesticide, organism in which it was tested, range, effective minimum dose, assay system and biological effect. In this book the definition of mutation is any inherited alteration in genetic material which in future generations may lead to a wide range of irreversible abnormalities. Pesticides may cause mutagenic hazards and this is the first book which presents recently developed mammalian methodologies for evaluating this hazard. The authors make clear that it is the metabolic products of a pesticide that create the danger. In the foreword, Dr. Joshua Lederberg emphasizes the critical needs for metabolic data in toxicologic testing in general and in mutagenicity testing in particular.

72-0446. Patric, J. H. (Timber and Watershed Lab., Northeast. Forest Exper. Sta., Forest Serv., USDA, Parsons, WV). **Herbicides and water quality in American forestry.** *Proc. Northeast. Weed Sci. Soc. 25: 365-375; 1971.* (54 references)

A review of the literature pertaining to the use of herbicides in forested areas to increase streamflow and thus the quantity of water available for consumption indicates that herbicide application for this purpose, if practiced in accordance with reasonable safety precautions, will not impair water quality. Residue studies revealed low-level contamination for varying lengths of time, depending on compound used and application site; other studies revealed a high degree of retention of herbicides in forest soils, followed by degradation of some chemical types, thus accounting for the low-level runoff.

72-0447. Byrd, B. C.; Williams, C. S.; Bjerke, E. L. (Author address not given). **An investigation of lateral surface movement: picloram.** *Proc. Northeast. Weed Sci. Soc. 25: 398, 1971.*

Since preliminary studies indicated the possibility of slight lateral movement of picloram (4-amino-3,5,6-trichloropicolinic acid, main ingredient of Tordon herbicide formulations) in response to water movement, more extensive bioassays of soil and water samples following picloram application were performed. These revealed slight lateral movement for short distances in response to the first rainfall following application, but the practical significance of such movement was questioned.

72-0448. Rosival, L.; Szokolay, A.; Gorner, F.; Madaric, A.; Uhnak, J. (Research Inst. of Hygiene, Bratislava, and Dept. of Biotechnology of the Slovak Technical U., Bratislava, Czechoslavakia). **Exposure to pesticides and protection of health of the population.** *Proc. Fourth Int. Congr. Rural Med.-Whither Rural Medicine? Edited by H. Kuroiwa et al. Jap. Ass. of Rural Med., Tokyo, Japan, 40-42; 1970.* (2 references)

Pesticide residues spread through the food chain from animal to man. Experimentation has been done on rabbits and ducklings to establish the effects of heptachlor residue. The rabbits were fed heptachlor contaminated sugar beets for 16 wk and at the end of that time they were analyzed for residue in the liver. Heptachlor epoxide was present but it had no adverse effect on the health of the rabbits or the ducks. Chlorinated insecticides which are a part of man's nutrition originate in foodstuff of animal origin. In 1965 the amount of DDT-DDE found in eggs was 0.2 ppm and in 1969 it rose to 5.7 ppm. It is seen from available data that BHC is most widely used in the U.S. A complex program aiming at the determination of the types and levels of pesticide residues in foodstuffs and in human population is needed.

72-0449. Long, K. R. (Preventive Medicine and Environmental Health, College of Medicine, U. of Iowa, IA). **Pesticide residues in the blood of migrant field workers in relation to occupational exposure.** *Proc. Fourth Int. Congr. Rural Med. - Whither Rural Medicine? Edited by H. Kuroiwa et al. Jap. Ass. of Rural Med., Tokyo, Japan, 71-75; 1970.* (1 reference)

Migrant farm workers were tested for the presence of pesticide residues in the blood. In the males there was an increase in *p,p'*-DDE residue from the age of 11 to 40. In the females there was an increase from the age of 40 on. A statistically significant difference was obtained at $p<0.05$ when *p,p'*-DDE values were compared and a significant difference at a probability level of $p<0.01$ when total chlorinated hydrocarbon residue values were compared. The primary difference in pesticide residue values exists between the young <20 and the older >40 years of age. The older have a greater pesticide residue level because of their extended exposure to pesticides.

72-0450. Motohashi, N. (Pharmaceutical and Supply Bureau, Ministry of Health and Welfare, Tokyo, Japan). **The present state of regulation for pesticide residue in specified foods in Japan.** *Proc. Fourth Int. Congr. Rural Med. - Whither Rural Medicine? Edited by H. Kuroiwa et al. Jap. Ass. of Rural Med., Tokyo, Japan, 82-84; 1970.*

Pesticide residue tolerances for γ-BHC, DDT, aldrin, dieldrin, endrin, parathion, methyl parathion, malathion, EPN, antibiotics and heavy metals have been established. The samples used for pesticide residue analysis were: rice, grape, cucumber, tomato, apple, strawberry, cabbage, radish, green-tea, Japanese pear, peach, potato, summer orange, spinach, eggplant, celery, welsh onion, and carrot. The maximum daily intake was established for rice as 0.405 kg (person/day), wheat and cereals 0.070, fruits 0.120, vegetables 0.270, potatoes 0.085 for a total of 0.950 kg. Ways of arriving at the residue tolerances are also discussed.

72-0451. Kasai, A. (Saku Central Hospital, Nagano Pref., Japan). **Studies on the analysis of pesticide residues in the human body and foods.** *Proc. Fourth Int. Congr. of Rural Med. - Whither Rural Medicine? Edited by H. Kuroiwa et al. Jap. Ass. of Rural Med., Tokyo, Japan, 86-88; 1970.*

Mercury residue accumulation in food and in the human body was measured using gas chromatography. Organochlorine residues in vegetables and the body were also reviewed. A gas chromatograph with a ^{63}Ni ECD detector was used for analysis. The average level of mercury found was 7.44 ppm and the organochlorine mean level was 0.71 ppm of γ-BHC, 0.80 ppm for DDT, and 0.04 ppm for aldrin. There is a clear correlation between the amount of pesticide dispersed and the amount found in the organs.

72-0452. Antonovich, E. A. (USSR). **Pressing problem of food sanitation following the use of agricultural chemicals.** *Proc. Fourth Int. Congr. Rural Med. - Whither Rural Medicine? Edited by H. Kuroiwa et al. Jap. Ass. of Rural Med., Tokyo, Japan, 90; 1970.*

This report is concerned with broadening the scope of the correlation between pesticides and plant organisms and between pesticides and food factors in foods, metabolism and pesticides in animals and plants and changes in their natural conditions. Data on the changes of some groups of pesticides (carbamates) in animal and plant organisms and the influence of pesticides on the chemical ingredients and biological values of foods are also reported.

72-0453. Dedek, W. (Deutsche Akademie der Wissenschaften zu Berlin, Institut fuer Biophysik, Abteilung Chemische Toxikologie, Leipzig, German Democratic Republic). **Residues in foods and domesticated livestock after organophosphorus insecticide applications.** *Proc. Fourth Int. Congr. of Rural Med. - Whither Rural Medicine? Edited by H. Kuroiwa et al. Jap. Ass. of Rural Med., Tokyo, Japan, 91; 1970.*

Results of six-years' studies on the application of ^{32}P-labeled trichlorfon, butonate, dichlorvos, dimethoate and bromophos, especially by pour-on application or intramuscular injection in cows, sheep, and pigs are discussed.

72-0454. Engelhardt, G.; Wallnoefer, P. R.; Plapp, R. (Bayerische Landesanstalt fuer Bodenkultur, Pflanzenbau und Pflanzenschutz, und Institut fuer Botanik der Technischen U. Munich, Germany). **Degradation of linuron and some other herbicides and fungicides by a linuron-inducible enzyme obtained from** *Bacillus sphaericus. Appl. Microbiol. 22(3): 284-288; 1971.* (12 references)

The hypothesis that the culture of *B. sphaericus* in the presence of linuron would induce the development of an enzyme responsible for the degradation of a number of herbicides was supported by the failure of such activity to develop in the presence of chloramphenicol, a known inhibitor of protein synthesis. The degradative activity could not be removed by protein separation, thus indicating that a single enzyme is involved. In order to determine whether the point of attack was the linkage between the carboxy group and the substituted nitrogen or the amide linkage between the aniline and the carboxy group, the degradation rates and products of other acrylanilides by the linuron-induced enzyme were studied. Substrate specificity for the methoxy-substituted phenylureas suggests the peptide bond between the amino and carboxy groups as the point of attack. The degradation rates, indicating highest specific activity for aminoacylanilides as substrates, classify the enzyme as an acylamidase. The increasing activity of cell-free extracts of *B. sphaericus* grown in the presence of linuron with increasing hydrophilicity of the substrates might explain the specificity of the enzyme for the methoxy-substituted phenylureas.

72-0455. Burnett, R. (Hopkins Marine Station, Pacific Grove, CA 93950). **DDT residues: distribution of concentrations in** *Emerita analoga* **(Stimpson) along coastal California.** *Science 174(4009): 606-608; 1971.* (15 references)

The total concentrations (tDDT) of DDT, DDD, and DDE in *Emerita analoga* from 19 California beaches reflect tDDT contamination nearby. Animals near the Los Angeles County sewer outfall contain over 45 times as much tDDT as animals near major agricultural drainage areas. Sediments near the outfall probably contain over 100 metric tons of tDDT–a reservoir for input into marine organisms. The effluent from a plant that manufactures DDT is a probable source. (Author abstract by permission, copyright 1971 by the American Association for the Advancement of Science)

72-0456. Hughes, L. B. (Purdue U., West Lafayette, IN). **A study of the fate of carbaryl insecticide in surface. waters.** *Diss. Abstr. Int. 32(6): 3108B; 1971.*

Pollution of soils and surface waters by pesticides is currently a serious problem. Pesticides which cause the most serious problems are those which are persistent. However, little is known about the fate of many pesticides in surface waters including carbaryl, a carbamate insecticide. The fate of carbaryl in farm pond waters was studied under laboratory conditions. It was found to chemically hydrolyze to 1-naphthol very rapidly in the pond water. This hydrolysis was catalyzed by organic and inorganic constituents in the pond water with substantial enhancement of the hydrolysis reaction resulting from shaking. Loss of 1-naphthol suggested chemical degradation. *Flavobacterium* was found to rapidly degrade 1-naphthol. With small numbers of the bacterium added to the pond water, 20 ppm of 1-naphthol were degraded within 12 days. Addition of a readily available carbon source, glucose, also increased rate of insecticide decomposition. Thin-layer chromatography showed three intermediate degradative products of carbaryl other than 1-naphthol. Two were identified to be *o*-hydroxycinnamic acid and silicylic acid; the third was not identified. (Author abstract by permission, copies of the thesis are available from University Microfilms, order No. 72-1885).

72-0457. Anderson, J. P. E. (The U. of Wisconsin, WI). **Factors influencing insecticide degradation by a soil fungus,** *Mucor alternans. Diss. Abstr. Int. 32(6): 3114B-3115B; 1971.*

Several fungi were isolated from an agricultural loam soil and tested for their capacity to degrade the insecticides DDT or dieldrin. It was found that *Mucor alternans* van Tieghen in shake cultures partially degraded DDT within 2 to 4 days into two water-soluble metabolites. None of the metabolites had Rf values that were identical to those observed with DDD, DDE, DDA, DBP, (4,4-dichlorobenzophenone), dicofol, and 1,1-bis (*p*-chlorophenyl)ethane. After application of ^{14}C-DDT, 42% of the totally recovered radioactivity was represented by the two water-soluble metabolites. Some indication of dieldrin breakdown by the fungus was evident. Degradation of both DDT and dieldrin occurred only with living mycelia, while the insecticides were absorbed on dead mycelial controls. The effects of nutritional factors on the capacity of pure cultures of *M. alternans* to degrade ^{14}C-DDT to water-soluble metabolites were also investigated. Fungal spores did not grow on media that contained DDT as the sole carbon source, but they remained viable over a 2-month period and developed into a mycelia, upon addition of glucose. Toxicity of the DDT to mycelia in medium containing the insecticide at a concentration of 50,000 ppm was not evident. The degradation of DDT by the fungus could not be related to the mass of mycelium formed during vegetative growth. The quantity of water-soluble metabolites produced from DDT was to some extent dependent on the insecticide concentration, but largely on the carbon and nitrogen sources in the culture media. The concentration of the glucose affected the metabolism quantitatively. With the exception of ribose, growth on the other sugars resulted in a decrease in the production of DDT metabolites. Growth of ^{14}C-DDT treated *M. alternans* in mixed culture with different species soil fungi caused a decrease (by 60 to 100%) in the quantities of water-soluble ^{14}C-metabolites recovered in culture media. Media from *M. mucedo* cultures inhibited growth of *M. alternans* by 25% and DDT-degradation by close to 100%. *Aspergillus fumigatus* media caused total inhibition of growth, whereas media from *Aspergillus niger* and *Fusarium oxysporum* had no effect on growth or DDT-degradation. Media from *Penicillium notatum* cultures appeared to stimulate DDT degradation by *M. alternans.* At concentration of 1 ppm, lindane, dyfonate, and parathion were found to partially inhibit DDT degradation by *M. alternans.* The growth of the fungus was not drastically affected. Aldrin, Arochlor 1254 (a polychlorinated biphenyl), azinphosmethyl, malathion, carbaryl, and temik did not affect either the growth of the fungus or its degradation of DDT. α-Naphthol and *p*-nitrophenol, which are hydrolysis products of carbaryl and parathion, respectively, also had no effect on growth or DDT degradation. (Author abstract by permission, modified; copies of the thesis are available from University Microfilms, order No. 71-25, 705)

72-0458. Schultz, D. P.; Tweedy, B. G. (Fish Pesticide Research Lab., U.S. Dept. of Interior, R.D. 1, Columbia, MO 65201). **The effect of light and humidity on absorption and degradation of diphenamid in tomatoes.** *J. Agr. Food Chem. 20(1): 10-13; 1972.* (8 references)

The effect of various light and relative humidity regimes on the absorption and degradation of *N,N*-dimethyl-2,2-diphenylacetamide (diphenamid) by tomatoes (*Lycopersicon esculentum* Mill.) was studied by extracting plants which were grown for 24, 48, and 120 hr in a nutrient solution containing ^{14}C-diphenamid. Plants grown under low light, low humidity conditions absorbed more diphenamid than those grown under high light, high humidity. Extracts of plants grown under high light, high humidity conditions contained a lower percentage of diphenamid and a higher concentration of a glucose-diphenamid complex than those grown under low light, low humidity conditions. The concentration of diphenamid increased in the shoots of plants grown under low light, low humidity but remained constant in plants grown under high light, high humidity. The concentration of the glucose-diphenamid complex in shoot extracts was nearly the same at all harvest periods and in all treatments. (Author abstract reprinted by permission of the American Chemical Society).

72-0459. Wright, F. C.; Riner, J. C.; Younger, R. L. (Toxicological Research Lab., Veterinary Sciences Research Division, Agricultural Research Service, U.S. Dept. of Agriculture, Kerrville, TX 78028). **Residues in chickens given DDT.** *J. Agr. Food Chem. 20(1): 17-19; 1972.* (14 references)

Adult chickens were dosed with 10 mg of *p,p'*-DDT per kg of body weight daily for 90 days and then killed. The residues of *p,p'*-DDT and related compounds were higher in the tissues of treated adult males than in tissues of treated hens. The highest residue levels were found in the fats and preen gland, and the lowest level were in the breast muscle and brain. The residue levels in control chickens were unchanged throughout the study. Yolks of eggs collected prior to the start of the study and at 30-day intervals during the study were analyzed for residues. Peak residues were found at 60 and 90 days. The tissues of chicks hatched from eggs collected during the 13th week of the study were analyzed. Peak residue levels were found at either day 1 or 7 after hatch. Residues had practically disappeared by 21 days after hatch. No residues were found in chicks of control chickens. (Author abstract reprinted by permission of the American Chemical Society)

72-0460. Wallnoefer, P. R.; Koeniger, M.; Safe, S.; Hutzinger, O. (Bayerische Landesstalt fuer Bodenkultur, Pflanzenbau und Pflanzenschutz, Munich, Germany). **Metabolism of the systemic fungicide 2,5-dimethyl-3-**

furancarboxylic acid anilide (BAS 3191) by *Rhizopus japonicus* and related fungi. *J. Agr. Food Chem. 20(1): 20-22; 1972.* (2 references)

Rhizopus japonicus and related fungi convert the systemic fungicide 2,3-dimethyl-3-furancarboxylic acid anilide (BAS 3191) into two metabolites, 2-hydroxymethyl-5-methyl-3-furancarboxylic acid anilide (M-2) and 2-methyl-5-hydroxymethyl-3-furan-carboxylic acid anilide (M-1). These metabolites, which were identified by nuclear magnetic resonance and mass spectrometric analysis, accumulate after a 1 week growth period. BAS 3191 (60 μmol/l.) was transformed into 23 μmol/l of M-1 and 12 μmol/l of M-2, respectively (Author abstract reprinted by permission of the American Chemical Society).

72-0461. Dorough, H. W.; Skrentny, R. F.; Pass, B. C. (Dept. of Entomology, U. of Kentucky, Lexington, KY 40506). **Residues in alfalfa and soils following treatment with technical chlordane and high purity chlordane (HCS 3260) for alfalfa weevil control.** *J. Agr. Food Chem. 20(1): 42-47; 1972.* (6 references)

Alfalfa was sprayed with technical chlordane and with a high purity chlordane (HCS 3260) which contained 98+% α- and γ-chlordane. The active ingredients (AI) of technical chlordane consisted of 14% of each of α- and γ-chlordane, 5% heptachlor, and 67% related compounds. Analyses were conducted for α-chlordane, γ-chlordane, heptachlor, and heptachlor epoxide which considered over 98% of the AI of HCS 3260 but only 33% of the AI of technical chlordane. Total ppm of these products deposited on alfalfa treated with the technical chlordane and HCS 3260 at the rate of 1 lb AI/acre were 29 and 130, respectively. In all tests, 95% of the residues on the alfalfa had disappeared after 21 days. Three days of field-curing freshly cut alfalfa reduced the level of residues by about 55%. Maximum total residues were 0.6 ppm in soil of alfalfa treated with 2 lb AI/acre of HCS 3260. By 21 days these residues had declined by 50%, and by 180 days 83% of the residues had dissipated. (Author abstract reprinted by permission of the American Chemical Society)

72-0462. Coggins, Jr., C. W.; Jolliffe, V. A.; Shindy, W. W.; Knapp, J. C. F. (Dept. of Plant Sciences, U. of California, Riverside, CA 92502). **Naphthaleneacetic acid disappearance and residue studies in citrus.** *J. Agr. Food Chem. 20(1): 76-79; 1972.* (6 references)

In a series of disappearance studies the quantity of 1-naphthaleneacetic acid (NAA) in Kinnow mandarin fruits 1 day after treatment was relatively high, decreased rapidly for a period of 2 to 3 weeks, and was present in amounts that were not significantly different from zero by the end of 3 to 6 weeks. Residue studies were conducted on nine varieties of citrus. In fruits that were young at treatment time but had matured by analysis time, residues were less than 0.07 ppm. However, the peel of the fruits that were mature at treatment time contained appreciable residues (0.58 to 0.52 ppm) 10 to 26 days after treatment. The loss of NAA from dry deposits of the acid and the ammonium salt was studied. Susceptibility of NAA to photodecomposition was confirmed and losses from sublimation were demonstrated for the first time. Sublimation and photodecomposition rates from deposits of the acid were faster than from deposits of the ammonium salt. (Author abstract reprinted by permission of the American Chemical Society)

72-0463. Hicks, B. W.; Dorough, H. W.; Mehendale, H. M. (Dept. of Entomology, U. of Kentucky, Lexington, KY 40506). **Metabolism of aldicarb pesticide in laying hens.** *J. Agr. Food Chem. 20(1): 151-156; 1972.* (7 references)

Aldicarb metabolism in laying hens was investigated and the nature and levels of residues in the eggs and tissues were determined. Single oral doses of aldicarb and/or aldicarb sulfonate at 0.7 mg/kg were excreted rapidly, with 75% of the doses in the feces by 24 hr. A large portion of the feces metabolites (50-60%) was as water-soluble materials, 10% as unextractables, and the remainder primarily as known hydrolytic products of aldicarb. Only minute quantities were as toxic carbamate compounds. Aldicarb equivalents in eggs reached a maximum of 0.18 ppm on the day after treatment but had declined to 0.01 ppm by ten days. In muscle tissues, residues of 0.2 to 0.3 ppm 6 hr after treatment declined to 0.01 ppm or less by 10 days. Residue levels in the liver and kidney were about twice those in the muscle tissue. The nature of the aldicarb metabolites in the eggs and tissues was similar to that in the feces. Aldicarb in the diet of hens for 21 days did not appear to alter the fate of the carbamate in the birds when compared to that when single oral doses were administered. (Author abstract reprinted by permission of the American Chemical Society)

72-0464. Westlake, W. E.; O'Neal, J. R.; Gunther, F. A.; Carman, G. E. (Dept. of Entomology, U. of California, Citrus Research Center and Agricultural Experiment Station, Riverside, CA 92502). **Persistence of the insecticide/acaricide phosalone on and in oranges and in laboratory-processed citrus pulp cattle feed.** *J. Agr. Food Chem. 20(1): 161-165; 1972.* (10 references)

Residue of phosalone [*O,O*-diethyl *S*-(6-chloro-2-oxobenzoxazolin-3-yl)methyl phosphorodithioate] were determined on and in mature Valencia oranges and in dried citrus pulp cattle feed prepared from the field-treated fruit. The residue half-life was 40-45 days, and about half of the residue remaining 35 days after treatment persisted into the dried cattle feed. Residues in the edible part of the fruit did not exceed 0.03 ppm at any time and were not detectable in samples taken 30 and 79 days after spraying. (Author abstract reprinted by permission of the American Chemical Society)

72-0465. Herzel, F. (Institut fuer Wasser-, Boden- und Lufthygiene, 1 Berlin 33, Corrensplatz 1, Germany). **Chlorkohlenwasserstoff-Insektizide in Oberflaechenwaessern. [Chlorinated hydrocarbon insecticides in surface waters.]** *Bundesgesundheitsbl. 14(13): 175-179; 1971.* (3 references) (German)

The results of examinations of surface waters, sediments and suspended material from various West German rivers and lakes for organochlorine pesticides are presented. Appreciable lindane concentrations (up to 865 ng per liter) were found at many points; endosulfan, DDE, and DDT were registered occasionally. Cleanup of sediments and suspended matter for GLC determination was troublesome. Reliable assignment of GLC peaks was not possible in all cases; the presence of polychlorinated biphenyls (PCBs) in many samples represented a severe impediment to pesticide identification.

72-0466. Herzel, F. (Institut fuer Wasser-, Boden- und Lufthygiene, 1 Berlin 33, Corrensplatz 1, Germany). **Spezifische Probleme bei der Rueckstandsuntersuchung in Gewaessern. [Specific problems in the investigation of residues in water.]** *Schriftenr. Ver. Wasser-, Boden-Lufthyg. 34: 117-123; 1971.* (German)

Highlights from the author's studies in pesticide residue analysis are presented. In order to cut down on the tedious process of solvent concentration after extraction of pesticides from water, it is advantageous to use the smallest solvent volumes compatible with acceptable recovery. Other means of decreasing loss of active ingredient include addition of less volatile components to the extract before concentration; use of a rotary evaporator rather than the air-stream method; and avoidance of distillation. Stream sampling also represents a serious problem, the various parameters and sources of inhomogeneity must be taken into account. Treatment of suspended materials in water samples must be standardized.

72-0467. Mosser, J. L.; Fisher, N. S.; Teng, T.-C.; Wurster, C. F. (Marine Sciences Research Center, State U. of New York, Stony Brook, NY 11790). **Polychlorinated biphenyls: toxicity to certain phytoplankters.** *Science 175(4018): 191-192; 1971.* (18 references)

Polychlorinated biphenyls (PCBs) are widespread pollutants of the marine environment. It was found that these compounds at concentrations as low as 10 to 25 ppb reduced the growth rates of two species of marine diatoms, *Thalassiosira pseudoma* and *Skeletonema costatum*. However, at concentrations at these or higher levels, the growth rates of a marine green alga, *Dunaliella tertiolecta* and two species of freshwater algae, *Euglena gracilis* and *Chlamydomonas reinhardtii* were not inhibited. It was suggested that selective inhibition of sensitive phytoplankton species by PCBs, DDT, and other stable pollutants in the environment may alter the species composition of natural algal communities, and that such effects at the base of aquatic or estuarine food webs could profoundly affect higher organisms.

72-0468. Liu, L. C.; Cibes-Viade H.; Koo, F. K. S. (Agricultural Experiment Sta., Mayaguez Campus, U. of Puerto Rico, PR). **Adsorption of atrazine and terbacil by soils.** *J. Agr. Univ. Puerto Rico 55(4): 451-460; 1971.* (10 references)

A correlation of soil properties with the adsorption percentage for the herbicides, atrazine (2-chloro-4-(ethylamino)-6-(isopropylamino)-*s*-(triazine) and terbacil (3-*tert*-butyl-5-chloro-6-methyl uracil) was studied using 34 types of Puerto Rico soils. The physical and chemical properties of each soil was tabulated. It was found that the various soils differed greatly in their capacity to absorb atrazine and terbacil. Atrazine was consistently absorbed to a greater degree than terbacil. Adsorption of atrazine was correlated positively with organic matter content, cation exchange capacity and magnesium and silt content but negatively with sand content. Adsorption of terbacil was correlated positively with organic matter, cation exchange capacity, soil pH, content of phosphorus, calcium, magnesium, and clay, but negatively with sand content of the soil. Representative adsorption isotherms of atrazine and terbacil on several important island soils devoted to sugarcane cultivation are given.

72-0469. Waite, G. K.; Passlow, T. (Author address not given). **Non-residue producing insecticides.** *Queensl. Agr. J. 97(8): 409-412; 1971.*

In England the individual producers of meat, dairy, and poultry products carry the primary responsibility to avoid undesirable hydrocarbon residues in their products. The only satisfactory means to avoid the application of DDT and other residue-producing insecticides such as endrin, dieldrin, lindane, toxaphene, and chlordane is to avoid their application and to use the recommended alternatives if and when pest control is warranted. The most serious pests for crops of primary food producers are discussed and the alternative non-residue producing insecticides are given for each pest together with the recommended usage per acre. Dimethoate or carbaryl are alternatives to the chlorinated hydrocarbons for jassid control. Carbaryl is recommended for lead rollers; trichlorphon for army worms and cutworms; for blue oat mite, azinphosethyl or methidathion, for brown wheat mite dimethoate is advised. Grasshoppers and locusts should be controlled by maldison; pasture webworms by trichlorphon; sorghum midge by diazinon or maldison; and corn ear worm by carbaryl. Growers are urged to consult local officers of the Department of Primary Industries before applying an insecticide.

72-0470. Bartsch, E.; Eberle, D.; Ramsteiner, K.; Tomann, A. (Agricultural Chemicals Division, CIBA-GEIGY Ltd., Basel, Switzerland). **The carbinole acaricides: chlorobenzilate and chloropropylate.** *Residue Rev. 39: vii, 93 p.; 1971.* (142 references)

In this review all pertinent data on the toxicology, metabolism, mode of action, application fields, residues of chlorobenzilate and chloropropylate, and analytical methods for the determination of residues on food are assembled and presented. The acute oral LD50 of chlorobenzilate is in the order of magnitude of approximately 700 to 3100 mg/kg depending on the solvent used; the acute oral LD50 of chloropropylate in rats was found to be greater than 5000 mg/kg. The dermal toxicity of both products is very low. In two-year chronic feeding studies in rats 40 ppm (=2.5 mg/kg/day) of each product proved to be a no-effect level. In similar two-year feeding studies in dogs 100 and 500 ppm of chlorobenzilate (=2.7 and 12.6 mg/kg/day) as well as of chloropropylate (=3.5 and 17.6 mg/kg/day) were found to be no-effect levels. In comparative tests both products were of a much lower toxicity to birds and fish than DDT. Fruits, citrus, grapes, tea, and vegetables, treated according to good agricultural practice, were analyzed for residues. The residue levels found some days after the last treatment are below the temporary tolerances proposed by FAO/WHO. Fourteen days after the last application approximately 1.5 ppm are found on fruits, 2.6 ppm on citrus peel, 1.0 ppm on grapes, 0.25 ppm on vegetables, and seven days after the last application>3.0 ppm on tea. The products are metabolized by some microorganisms but not in or on plants. They are translocated into the plant soon after application. The tolerances established range between 0.2 and 8 ppm, and are mostly 5 ppm. Analytical methods for the determination of the residues are presented. The technical materials may be analyzed by determination of the total chlorine content or by saponification of the ester group or by a gas chromatographic method. The methods used are suitable for both types of formulations: emulsifiable concentrates and wettable powders. Extraction and cleanup procedures for residue analysis followed by gas chromatographic and spectrophotometric determination are reviewed. An improved method for residue analysis is recommended. In this method the extract is from crop material with acetone/hexane. The extract is chromatographed on an alumina column to remove interfering materials. Quantitative measurements are made, using a gas chromatograph with a microcoulometric titration cell sensitive to chloride. (Author abstract, by permission, modified).

72-0471. Machin, A. F.; Quick, M. P.; Janes, N. F. (Central Veterinary Lab., New Haw, Weybridge, Surrey, England). ***O*-2-acetyl-6-methyl-pyrimidin-4-yl *O,O*-diethyl phosphorothioate: a new degradation product of diazinon.** *Chem. Ind. (London) 42: 198-199; 1971.* (7 references)

Diazinon is an indirect inhibitor of cholinesterase and when degraded, either by weathering on sprayed crops or by ultraviolet irradiation gives a mixture of products, some which still inhibit cholinesterase either directly or after oxidation. The identification of another indirect inhibitor, produced by ultraviolet irradiation, as *O*-2-acetyl-6-methyl-pyrimidin-4-yl *O,O*-diethyl phosphorothioate is reported in this paper. Irradiation of diazinon in hexane, followed by purification, yielded a product which could be detected on TLC plates by 2,6-dichloro-*p*-benzoquinone-4-chloroimine and by cholinesterase inhibition after, but not before, bromine oxidation, showing it to be a fully esterified phosphorothionate. Comparison of the inhibition of cholinesterase on TLC plates after oxidation of the thion group to oxon suggested that the title compound is a stronger indirect inhibitor than diazinon. It is probably formed on crops sprayed with diazinon, but its importance as a toxic residue cannot be assessed without knowledge of its toxicity to insects and mammals and of its stability.

72-0472. Edwards, R. (H.J. Heinz Co. Ltd., Hayes Park, Hayes, Middlesex, England). **The polychlorobiphenyls, their occurrence and significance: a review.** *Chem. Ind. (London) 47: 1340-1348; 1971.* (70 references)

Environmental contamination with polychlorinated biphenyls (PCBs) which are widely used in industry as fillers, plasticizers, lubricants and for many other purposes, is closely related to contamination with organochlorine pesticides because of their high degree of similarity in properties to the latter. The route by which they contaminate the environment is different: whereas for the organochlorine pesticides it is primarily agricultural, the PCBs generally reach marine and terrestrial food chains via industrial effluents entering the sewage sludge, which is then disposed of in the sea or by spreading over the land surface. Levels found in marine and avian fauna vary widely, depending on diet, migration and other factors. PCBs have been found in man and his foodstuffs, generally below 0.1 ppm and comparable to DDT levels. Higher levels were found in eggs, butter and human milk. Direct toxicity has been demonstrated in man, birds, crustacea, molluscs and other species; synergism with organochlorine insecticides was found. Commercial preparations of PCBs sometimes contain highly toxic oxygenated impurities. Methods of separation and analysis are discussed. Continuing vigilance is required in view of the extreme persistence of these chemicals, possible concentration effects, and long-term hazards to the species.

72-0473. Noguchi, M.; Kaneda, Y.; Mochida, K.; Yoshimura, K. (Osaka Branch, National Inst. of Hygienic Sciences, Osaka, Japan). **[Organochlorine pesticide residues in crude drugs. I. Improved screening methods for organochlorine pesticide residues.]** *Shoyakagaku Zasshi 25(1): 33-39; 1971.* (21 references) (Japanese)

An analytical scheme was developed for organochlorine pesticide residues in crude drugs of natural origin. Extraction of the materials (roots, rhizomes, stems, leaves, fruits and seeds) with acetonitrile-hexane partition gave cleaner gas chromatograms than benzene

extraction. Practically 100% recoveries of pesticides were made from florisil columns eluted with hexane containing 6% ethyl ether in the case of all pesticides tested. Eluates from florisil columns were subjected to final cleanup on silica gel columns for all pesticides tested, except for dieldrin, which required an MgO-celite column. BHC isomers were present at 0.15-2.74 ppm in all of the crude drugs tested except those grown in pesticide-free experimental plots. DDT isomers, heptachlor epoxide and dieldrin were found in isolated instances. Highest of pesticide levels were found in leaves, followed by roots and rhizomes, and finally by fruits, seeds and latex.

72-0474. Noguchi, M.; Kaneda, Y.; Mochida, K.; Yoshimura, K. (Osaka Branch, National Inst. of Hygienic Sciences, Osaka, Japan). **[Organochlorine pesticide residues in crude drugs. II. Residual organochlorine pesticides in commercial ginseng radix.]** *Shoyakagaku Zasshi 25(1): 40-46; 1971.* (15 references) (Japanese)

Based on the method outlined in the previous report of this series (*Shoyakugaku Zasshi 25(1): 33-39; 1971,* for an abstract see **72-0473**), the organochlorine residues found in various parts of ginseng plants grown in Japan and Korea were determined. Identities of the dieldrin and heptachlor epoxide extracted were verified by gas chromatography-mass spectrometry. BHC isomers were found in all of the 33 samples investigated, from both Korea and Japan, at 0.27-2.96 ppm. Twenty of the samples contained *p,p'*-DDT and *p,p'*-DDE (0.03-1.09 ppm). Heptachlor and heptachlor epoxide were found only in the samples grown in Korea (0.04-2.25 ppm), whereas dieldrin occurred only in those grown in Japan (0.07-6.03 ppm). The concentration of organochlorine pesticides in the epidermis and lateral roots was higher than that in white ginseng, and red ginseng contained lower quantities of insecticidal residue than others. Thus removal of organochlorines from ginseng by physicochemical methods can be expected to bring the residues to levels acceptable for human consumption.

72-0475. Hekmati, M.; Bradley, Jr., R. L. (Dept. of Food Science, U. of Wisconsin, Madison, WI 53706). **Degradation of organochlorine pesticides with hydrogen peroxide.** *Milchwiss. 26(4): 224-226; 1971.* (4 references)

It has been reported that hydrogen peroxide will degrade organochlorine insecticide residues which contaminate milk supplies. Hydrogen peroxide is used as a preservative in areas of the world where refrigeration is nonexistant or limited and insecticide use is uncontrolled. In this way hydrogen peroxide serves a dual purpose as a preservative and as a residue degradant.

72-0476. Ackermann, H.; Fechner, G.; Berger, H. (Institut fuer Ernaehrung, Potsdam-Rehbruecke, Germany). **Untersuchungen zur Rueckstandsbestimmung von Butonate in Milch. [Studies on the residues of butonate in milk.]** *Arch. Exp. Veterinaermed. 25(2): 199-204; 1971.* (6 references) (German)

The residues of butonate, trichlorfon, and dichlorvos in milk were separated, identified, and assayed by combining thin-layer chromatography and an enzymatic method. The method was sensitive enough to detect concentrations of 0.01 ppm butonate, 0.005 ppm trichlorfon, and 0.002 ppm dichlorvos. Tests showed that equal concentrations of butonate and trichlorfon were excreted; dichlorvos was not found in the milk.

72-0477. Begliomini, A.; Fravolini, A. (Istituto Zooprofilattico Sperimentale dell'Umbria e delle Marche, Perugia, Italy). **Residui di insetticidi nei mangimi. Nota II. Identificazione e dosaggio gas cromatografico di insetticidi clorurati ed esteri fosforici in mangimi composti. [Insecticide residues in animal feeds. Note II. Identification and determination of organochlorine and organophosphate insecticides in feeds by gas chromatography.]** *Arch. Vet. Ital. 22(2/3). 109-118; 1971.* (7 references) (Italian)

In order to study the distribution of the organocholorine and organophosphate insecticides in animal feeds in Italy, a gas chromatographic analysis method was developed. After extraction with 65% acetonitrile, the extracts were selectively eluted on a florisil column. Of the 15 chlorinated hydrocarbon and 2 organochlorine pesticides determined, only methyl parathion and 2,4-D *n*-butylester could not be separated in this manner. Fifteen brands of feed each, intended for hogs, broilers, calves and laying hens, were examined. Lindane was found in appreciable quantities in all feeds investigated; methyl parathion and parathion were present in about 22% of the hog and calf feeds examined, but not in the chicken feeds. Heptachlor, dieldrin, and DDT or its metabolites were also present in high percentages of the feeds examined. Thus contamination of animal feeds appears to represent a serious source of persistent insecticides in the human diet.

72-0478. Seba, D. B.; Prospero, J. M. (Rosenstiel School of Marine and Atmospheric Science, U. of Miami, 10 Rickenbacker Causeway, Miami, FL 33149). **Pesticides in the lower atmosphere of the northern equatorial Atlantic Ocean.** *Atmos. Environ. 5(12): 1043-1050; 1971.* (29 references)

Results and implications of additional measurements made of the concentrations of *p,p'*-DDT and *p,p'*-DDE in the northeast trade winds are reported. Airborne pesticide collections were made at the University of Miami Aerosol Sampling Station, Barbados, West Indies (13°N,59°W) from November 22 to December 4, 1968. There was no correlation between the air concentration of these pesticides and that of airborne dust which is believed to be derived from arid regions of West Africa.

Evidence suggested that the pesticides originated from the higher latitudes, either Europe or North America. This pesticide concentration is probably brought to the lower latitudes by the clockwise air flow around the Azores high pressure center. On occasion, air parcels from the northern latitudes are incorporated into the northwesterly low level flow which sweeps inland along the northwest coast of North Africa; these air parcels often play a role in generating dust storms in the region of Spanish Sahara, Mauritania and Senegal. The dusty air subsequently turns westward and moves off the coast of Africa to form the trade winds which then proceed across the Atlantic. Eventually the trade wind air parcels will either penetrate into the Caribbean or enter the North Atlantic, again as part of the anticyclonic flow around the Azores high pressure center.

72-0479. Otto, S.; Drescher, N.; Hahn, S. (Landwirtschaftliche Versuchsstation Limburgerhof/Pfalz, der Badischen Anilin- & Soda-Fabrik AG, Limburgerhof, Germany). **Ruechstandsuntersuchungen mit Tridemorph. [Determination of tridemorph residues.]** *Meded. Fac. Landbouwwetensch. 36(1): 419-424; 1971.* (German)

Tridemorph (*N*-tridecyl-2,6-dimethylmorpholine) is the active ingredient of Calixin, a commercial fungicide used to control powdery mildew. Residues from various sources, grains, straw, milk, were determined by wet chemical method utilizing solvent extraction and steam distillation. Accuracy of the method was estimated to be 0.05 ppm. Results showed that tridemorph residues from corn, spring barley, spring wheat, and winter barley treated with Calixin lie below the detection limit if samples are taken more than 50 days after treatment. In straw, residues of up to 1.4 ppm can be detected in samples taken 60-80 days after treatment. Tolerances of 1.0 ppm in corn and 1.5 ppm in straw have been proposed for tridemorph. These figures are based on the highest residues detected and take into account the results of a 90-day feeding trial with rats and dogs. The question of milk contamination by residues was examined in a feeding trial with 2 dairy cows. 10 ppm Calixin (approx. 500 mg tridemorph) was added to the animals' feed every day for 14 days, and 1 liter of milk from each milking was removed for analysis, milk from untreated animals being used as a control. The detection limit of the method was 0.0 ppm. At no time during the trial were active ingredient residues detected in the milk. As the amount of active ingredient absorbed under normal conditions from residues in feed straw is almost certainly far below the amount given daily in the feeding trial, no risk of contamination arises.

72-0480. Greve, P. A. (Rijksinstituut voor de Volksgezondheid, Utrecht, The Netherlands). **De persistentie van endosulfan in oppervlaktewater. [Persistence of endosulfan in surface waters.]** *Meded. Fac. Landbouwwetensch. 36(1): 439-447; 1971.* (4 references) (Dutch)

Important variables in the degradation of endosulfan in surface water are the type of silt present, type of bacteria present, the pH, and the oxygen content. Relatively small changes in the environment are able to significantly alter the degradation processes. Water reacts with endosulfan to yield endosulfan-alcohol. In the presence of oxygen, endosulfan reacts to form endosulfan sulfate which is then converted to endosulfan-alcohol. Studies of bacterial degradation of endosulfan have shown many new peaks in the gas chromatograms which can not be ascribed to any of the known metabolites, except endosulfan sulfate, which, however, is far from a predominant peak. Removal of endosulfan in the purification of surface water to drinking water is most easily accomplished by adsorption techniques. River silt readily adsorbs endosulfan; more than 80% of the endosulfan present can be removed by simple filtration. Still better adsorption is brought about by ferric hydroxide-gel and charcoal. Ferric hydroxide-gel catalyzes the hydrolysis of endosulfan, notably in the adsorbed phase.

72-0481. Martens, P.; Zenon-Roland, L. (Faculte des Sciences agronomiques de Gembloux, Centre de Recherches de Phytopharmacie, Brussels, Belgium). **Fruits et residus de pesticides agricoles. [Fruits and residues of agricultural pesticides.]** *Fruit Belg. 38(353): 61-66; 1971.* (French)

Chemical treatment is a necessary evil in agriculture, but dangers can be minimized by observing instructions and regulations. The three basic types of pesticides used in horticulture are insecticides, fungicides, and herbicides. Organic chlorinated and organophosphorus pesticides are used extensively, especially DDT. Pesticide residues on fruit can be extracuticular, cuticular and intracuticular. The amount of residue is a function of time and the concentration of the spray liquid used; related formulae are given. Weather conditions also affect pesticide contents in fruits. Processing and treatments following harvesting result in various degrees of reduction in pesticide contents. Various solutions are suggested to protect consumers: care in applying pesticides is most important, and observance of allowable doses by farmers should be checked. The major danger resides in the failure to comply with instructions for the proper use of pesticides. Data are furnished on the application of different pesticides and residues measured in fruits.

72-0482. Karlog, O.; Kraul, I.; Dalgaard-Mikkelsen, S. (Inst. of Pharmacology and Toxicology, Royal Veterinary and Agricultural U., Copenhagen, Denmark). **Residues of polychlorinated biphenyls (PCB) and organochlorine insecticides in liver tissue from terrestrial Danish predatory birds.** *Acta Vet. Scand. 12(2): 310-312; 1971.* (3 references)

Analytical results are reported from screening

livers for organochlorine insecticides, (DDE, DDD, and dieldrin) and PCB (polychlorinated biphenyls) from 52 terrestrial birds of Denmark and Greenland. Purification and isolation of the organochlorines was carried out by gas chromatography. Fourteen livers contained more than 1 ppm PCB. DDT was never detected in this material. There was a correlation between the concentration of organochlorine insecticides and PCB, with a much higher load of the latter. In 41 birds in which DDT metabolites and dieldrin were found, the concentration of PCB did not exceed 1 ppm in the liver; only owls and sparrow hawks contained a significiant amount.

72-0483. Richardson, E. M.; Epstein, E. (Public Health Lab., Dept. of Health and Welfare, State House, Augusta, ME). **Retention of three insecticides on different size soil particles suspended in water.** *Soil Sci. Soc. Amer. Proc. 35(6): 884-887; 1971.* (12 references)

Two types of soil (Marshall silt loam from Iowa and Caribou silt loam from Maine) of different sized particles were used to determine their retention of DDT, endosulfan and methoxychlor. To study the effect of organic matter on pesticide retention, hydrogen peroxide was used to treat portions of each soil. Both treated and untreated soils retained DDT and methoxychlor in the clay fraction. The greatest retention of the three insecticides in the untreated soils was on the colloidal ($<0.08\mu$) and 0.08-0.5μ fraction. The retention on both soils was reduced when the organic matter was removed. Although the three insecticides followed analogous tendencies within a soil, the two soils reacted differently to hydrogen peroxide. Adsorption depends on organic matter; however, other soil properties are also responsible.

72-0484. Champion, D. F.; Olsen, S. R. (USDA, Plant Science Bldg., Colorado State U., Ft. Collins, CO 80521). **Adsorption of DDT on solid particles.** *Soil Sci. Soc. Amer. Proc. 35(6): 887-891; 1971* (8 references)

The effects of positively and negatively charged adsorbents and several soils on the adsorption of DDT was studied to elucidate the factors affecting adsorption of DDT by soils and sediments. Adsorption of labeled DDT was strongly enhanced by the presence of a positively charged adsorbent in a water solution; the adsorption was very strong, since little or no desorption occurred when inorganic ions or additional non-labeled DDT was added to the systems. The adsorption of DDT may depend in part upon three chlorine atoms attached to one carbon atom of DDT. Also, physical adsorption occurs on the surface of the adsorbents by van der Waals forces. The chlorine atoms on the ethyl group of the DDT molecule may have a residual negative charge strong enough to be attracted to positively charged sites. The results of the experiments show that soils and sediments of low pH or high anion exchange capacity, or both, would tend to adsorb more DDT than soils of higher pH. In addition, the presence of aluminum and possible iron oxides in soils, as well as suspended and soluble soil matter, may strongly influence the persistence and movement of DDT in soils and waterways.

72-0485. Guenzi, W. D.; Beard, W. E.; Viets, F. G. (Northern Plains Branch, Soil and Water Conservation, Res. Div., ARS, USDA, Ft. Collins, CO 80521). **Influence of soil treatment of persistence of six chlorinated hydrocarbon insecticides in the field.** *Soil Sci. Soc. Amer. Proc. 35(6): 910-913; 1971.* (12 references)

The persistence of chlorinated insecticides in well-aerated soils has been demonstrated previously. The present study was designed to compare the rate of disappearance of dieldrin, heptachlor, lindane, DDD, and DDT from flooded and non-flooded soils. The effects of soil wetting and drying, soil mixing, adding alfalfa as a microbial energy source, and flooding the soil were studied. The results definitely show that if the redox potential in field soils can be reduced to about 250 mv, a substantial reduction of heptachlor, DDT, lindane, and endrin residues can be obtained. These conditions could be obtained by adding very large amounts of alfalfa, cattle manure, or any other material that would have a high biological oxygen demand. Flooding would also provide ideal conditions for degradation, but this may be difficult to obtain in many soils. The most logical management system would be to add a large amount of an available organic energy source (alfalfa, cattle manure, etc.) and keep the soil as wet as possible during the summer months.

72-0486. Woolson, E. A.; Axley, J. H.; Kearney, P. C. (Plant Science Research Div., ARS, USDA, Beltsville, MD 20705). **The chemistry and phytotoxicity of arsenic in soils: I. Contaminated field soils.** *Soil Sci. Soc. Amer. Proc. 35(6): 938-943; 1971.* (40 references)

Surface soil samples were taken from an area with a history of arsenic application and the residue determined averaged 165 ppm arsenic; in the untreated area nearby the arsenic residue averaged 13 ppm. A modified soil P procedure was used to determine the arsenic residue, most of which was found as Fe-As (0.1 *N* sodium hydroxide extractable). Arsenic was also detected in the water-soluble form in two states. If the amount of "reactive" aluminum or calcium is high and reactive iron is low then Al-As and Ca-As (0.5 *N* ammonium fluoride and 0.5 *N* sulfuric acid extractable) may predominate. There was a correlation of 0.74 between growth reduction and total As and 0.82 with a summation of As fraction in contaminated and uncontaminated soils. Soils which were high in reactive aluminum tolerated large application (670 ppm) of arsenic.

72-0487. Biros, F. J. (Perrine Primate Res. Branch, Div. of Pesticide Chemistry and Toxicology, Perrine, FL 33157). **Recent applications of mass spectrometry and combined gas chromatography-mass spectrometry to pesticide residue analysis.** *Residue Rev. 40: 1-63; 1971.* (160 references)

The mass spectral fragmentation behavior of the major insecticide classes (organophosphates, organochlorines, and carbamates) as well as miscellaneous compounds is discussed on a mechanistic basis. Examples of fruitful application of mass spectrometric techniques in residue analysis include studies on animal metabolism of pesticides, plant- and soil-induced chemical alteration of pesticides, and photodecompositon of pesticides. The latter is currently of interest due to correlations observed between mass spectrometric fragmentation mechanisms and ultraviolet radiation effects. Combined gas chromatographic-mass spectrometric techniques permit definitive structural characterization in a single experimental approach, especially in view of the increasing literature availability of mass spectral data. Instrumental considerations and techniques for preparatory isolation of individual residues are discussed.

72-0488. Walker, P. T. (Tropical Pesticides Research Unit, Porton Down, Salisbury, England) .**The use of granular pesticides from the point of view of residues.** *Residue Rev. 40: 65-131; 1971.* (409 references)

The use of pesticide granules (8-60 U.S. mesh) is associated with many of the residue problems encountered with other formulations, but may offer improvements via greater selectivity of application, or more serious problems due to slow-release properties. Granules always contain a dust fraction which must be considered. Controlled, even distribution, whether by ground equipment or by air, has been the subject of several studies. Extensive literature citations are presented on the use of granular pesticides in water for control of aquatic and crop pests and weeds. In the case of soil application, some factors which are less important with other application forms come into play, such as root shape of plants in relation to pesticide placement. Examples of residues found after soil application are given, including residues in food animals. The location of residues in crop plants is important. Increased information relating specifically to granular pesticide formulations is demanded.

72-0489. Mestres, R.; Belamie, R.; Aguesse, P. (Laboratoire de Chimie appliquee a l'expertise, Faculte de Pharmacie de Montpellier, France). **Role joue par les substances organochlores dans la pollution des eaux douces. [The role of organochlorines in fresh water pollution].** *Trav. Soc. Pharm. Montpellier 31(2): 85-96; 1971.* (15 references) (French)

Increasing pollution of the rivers in France is creating serious ecological problems. Technical BHC, γ-BHC (lindane) aldrin and DDT are among the pesticides detected in rivers in central France, in both agricultural, and highly urbanized regions. Methods of sampling, extraction, and purificiation are described. Analyses were made by means of chromatographic, microcoulometric, and electron-capture detector methods. It was difficult to distinguish organochlorine pesticide residues from those of plasticizers. The investigations revealed residues of organochlorine pesticides in rivers, and also traces of plasticizers, the latter identified as pentachlorobiphenyl, and a polyethylene plasticizer containing, among others, α- and γ-BHC.

72-0490. Mestres, R.; Chevallier, C.; Cornet, R. (Laboratoire de Chimie appliquee a l'expertise, Faculte de Pharmacie, Montpellier, France). **Etude au laboratoire de la penetration du dursban. [A laboratory study of the penetration of Dursban.]** *Trav. Soc. Pharm. Montpellier 31(2): 109-124; 1971.* (French)

Preliminary laboratory studies on the penetration of Dursban (*O*-3,5,6-trichloro-2-pyridinyl-*O,O'*-diethylphosphorothioate) were carried out on pilot scale to avoid the disturbing effects due to wall, capillarity, and heterogeneity in narrow columns. An upright metal barrel with drain pipes in different levels was filled up to a height of 62 cm, with sand and soil, which was flooded by a sheet of water of 10-20 cm thickness. The insecticide was added both to this water and through the lateral pipes. Dursban contents in water, and in the test soils were determined as a function of time in various depths. The analyses were made by means of a gas chromatograph and a Brody-Chaney type flame photometer. The Dursban introduced into water was rapidly fixed by fine particles on the soil surface, and diffused rapidly into the soils, without percolation being necessary. The effective insecticide content in the sheet of water is decreased by intense adsorption on surface, and the concentrations in subterranean water drop very rapidly with increasing depth. The concentrations absorbed by the two different types of soil are of the same order.

72-0491. Mestres, R.; Chevallier, C. (Laboratoire de Chimie appliquee a l'expertise, Faculte de Pharmacie, Montpellier, France). **Etude au laboratoire de la penetration de l'abate. [A laboratory study of the penetration of Abate.]** *Trav. Soc. Pharm. Montpellier 31(2): 125-132; 1971.* (2 references) (French)

To investigate the penetration of Abate, (*O,O, O'O'*-tetraethyl-*O,O'*-thiodi-*p*-phenyl phosphorothioate) this substance was dissolved in water to a concentration of 28 mg/liter covering the sand and clay soil. Abate concentrations were measured in water and soil samples from different depths as a function of time using gas chromatography and flame photometry. The Abate added to water diffused rapidly into the soil making percolation unnecessary. The concentration of Abate in water is sharply reduced by intense adsorption on the surface but it penetrates sufficiently to a depth of 60 cm, in concentrations comparable to those in the water sheet covering the soil. Abate penetrates to a greater degree than Dursban.

72-0492. Mestres, R.; Chevallier, C.; Rioux, J. A.; Cousserans, J.; Sinegre, G. (Laboratoire de Chimie appliquee a l'expertise, Faculte de Pharmacie, Montpellier, France). **Penetration de deux insecticides dans les sols halomorphes temporairement submerges. [Penetration of two different pesticides in temporarily flooded halomorphic soils.].** *Trav. Soc. Pharm. Montpellier 31(2): 159-166; 1971.* (4 references) (French)

Two test sites were flooded by a sheet of water containing Dursban and Abate to study the penetration of these pesticides into the soil. These organophosphorus insecticides are used in France to control *Ceratopogonidae,* particularly *Leptoconops irritans* and *Leptoconops kerteszi.* The penetration experiments were carried out predominantly on clay soils. In a field test a basin of 1.20 X 1.70 m was flooded by brackish water to which Abate was added. After drainage of the water, soil samples were taken from various depths and the water analyzed for Abate content. In another experiment at a permanent test station, two sites were flooded by pond water to which Abate and Dursban was added, respectively. The two insecticides diffused rapidly through the interstitial water and were adsorbed by the soil. Of the two, Abate penetrated more readily through the top layers of soil, despite its lower stability.

72-0493. Stathopoulos, D. G.; Zenon-Roland, L.; Beirnaux, J.; Suetin, E. (Agronomy Research Sta. for Plant Protection, Thessaloniki, Greece). **Lutte contre *Psila rosae F.* en 1969. II. Teneurs en insecticides organo-phosphores dans les carottes et dans le sol. [Fighting *Psila rosae F.* in 1969. II. Organophosphorus insecticide contents in soil and carrots].** *Meded. Fac. Landbouwwetensch. 36(1): 410-418; 1971.* (4 references) (French)

Residual amounts of three organophosphorus insecticides chlorfenvinphos, diazinon and trichloronate (2,4,5-trichlorophenyl ethylphosphonothioate) were studied in soil and carrot samples following application against the carrot fly (*Psila rosae*) during the 1969 season. Half-life rates for chlorfenvinphos, diazinon and trichloronate were 60, 25 and 65 days, respectively, as deduced from analytical determinations on soil and carrot samples taken monthly. At harvest, the trichloronate residues in carrots were somewhat above their tolerance limit but the preservation treatments reduced the residual levels of all three tested compounds below detectable limits.

72-0494. Sheets, T. J.; Jackson, M. D.; Phelps, L. D. (Pesticide Residue Res. Lab., School of Agriculture and Life Science North Carolina State U., Raleigh, NC). **A water monitoring system for pesticides in North Carolina.** *N.C. State U., Water Resour. Res. Inst. Rep. No. 19; 1970. 105 p.* (33 references)

Methodology was developed for an effective monitoring system for pesticide residues in surface waters of North Carolina. The suitability of available sampling and analytical methods for this specific application was first determined; some of these required substantial modification to allow for economic feasibility. Monthly analysis of composited weekly grab samples appears to be the most feasible water sampling procedure. Concentrations in sediment were 10 to 10,000 times higher than those found in water, but analysis of both is necessary. The p-values (partition from *n*-hexane into acetonitrile) of the presumed insecticide residues were compared with those of known specimens to provide some confirmation of identity beyond the gas chromatographic peaks, and in at least one instance, revealed that the GC values were too high. On the basis of this preliminary study, in which only the most persistent pesticides, the organochlorines, were determined, a program for monitoring the surface waters of North Carolina for other substances as well is set up. Estimations of pesticide priorities in drainage basins are employed in establishing sampling methods and analytical procedures for a broader future program.

72-0495. Butler, L. I.; Landis, B. J.; McDonough, L. M. (USDA, ARS, Entomology Res. Div., Yakima, WA). **Residues of DDT and metabolites in the soil and in alfalfa grown on former orchard land.** *Wash. Agr. Exp. Sta. Circ. 522, June 1970; 5 p.* (7 references)

When DDT residues were found in alfalfa grown on soil in 1967 which had been used as an orchard prior to 1960, the source of the residue was sought. DDT had not been applied in the area since 1959; however, previous studies had demonstrated uptake of DDT-containing orchard sprays by vegetable crops for many years. Therefore, three types of extracts were analyzed for DDT and its analogs by gas chromatography: chloroform washes and chloroform extracts of water washes of alfalfa plants with roots removed; chloroform extracts of macerated alfalfa foliage; and chloroform extracts of soil cores. About 15% and 4%, respectively, of the DDT-related residues were taken up in the chloroform and water washes. Total residues in alfalfa were 45-189 ppb; in soil, 5900-11,840 ppb. This low percentage in the alfalfa and even lower on the plant surfaces is consistent with the hypothesis that the residues became imbedded in the plant as a result of mechanical action, i.e., action of soil thrown against the plant by wind and water. The relatively high DDE levels in soil and plant (25 and 19%, respectively) indicate the considerable age of the residues.

72-0496. Anonymous. **National pesticide residues survey.** *Brit. Food J. 73(845): 168-169, 178; 1971.*

Results are summarized for a second report (first report published in *Brit. Food J. 71: 35, 44; 1969. [sic]*) following another 12-month study of pesticides in foodstuffs in England. Analysis results of the first period were kept under constant study, and particular trends which emerged were used in the second period. The re-

sults in this period broadly confirmed the previous findings, showing no evidence of any gross contamination, and are not considered to warrant any vigorous follow-up action. Pesticide types are listed together with conclusions on the findings. These types include: organochlorine residues, organophosphate residues, arsenic and lead residues, and mercury residues.

72-0497. Rosen, J. D.; Siewierski, M. (Dept. of Agricultural Chemistry, Rutgers, the State U. of New Jersey, New Brunswick, NJ 08903). **Photolysis of 4-amino-3-methylthio-6-phenyl-1,2,4-triazin-5-one (Aglypt).** *Bull. Environ. Contam. Toxicol. 6(5): 406-408; 1971.* (5 references)

Photolysis of Aglypt, a herbicide, in aqueous solution proceeds rapidly with formation of the deaminated derivative, as revealed by mass spectroscopy of the main TLC spot and confirmed by infrared analysis in comparison with a synthesized sample. The photochemistry of Aglypt is thus analogous to that of the 6-alkyl-substituted triazinones which were previously studied. Within 4 hours of exposure to sunlight in early November, less than 10% of the Aglypt present remained; at this time, the available solar energy in the wavelength at which Aglypt absorbs is approximately 16% of that available in early May. Studies on spinach chloroplasts indicated that herbicidal effectiveness of Aglypt would not be seriously diminished as a result of photolysis, whereas field trials of the deaminated derivative showed that it had no value as a pre- or post-emergence herbicide.

72-0498. Skrentny, R. F.; Hemken, R. W.; Dorough, H. W. (U. of Kentucky, Lexington, KY 40506). **Silo sealants as a source of polychlorobiphenyl (PCB) contamination of animal feed.** *Bull. Environ. Contam. Toxicol. 6(5): 409-416; 1971.* (6 references)

Of the many possible sources of PCB contamination in food and feed, paints and sealants for silo walls and feed troughs seemed likely as a route of entry into dairy-cattle feed and thus into milk. Paint chips and silage samples collected at various distances from the walls of silos painted or sealed with PCB-containing materials were analyzed by gas chromatography; limited-solubility experiments using water and silage extract in contact with silo wall chips were also performed. The PCB residues found in the study displayed relative component peak heights identical to those of the Aroclor sample used, so that rough quantification was possible. The greatest amounts of residues in the silage were found within 6 inches of the wall; extraction of PCBs from paint chips by water and silage extracts indicates that the PCBs contaminate silage by dissolving in the silage liquor which moves out from the wall and downward. If silage near the wall is discarded and not mixed with the remainder, it might be possible to avoid contamination of milk and meat of animals feeding on the remaining silage. Residues up to 10,000 ppm were found in silo wall chips and 31 ppm in silage.

72-0499. Dyment, P. G.; Hebertson, L. M.; Decker, W. J.; Gomes, E. D.; Wiseman, J. S. (Pediatric Service and Dept. of Medical Research and Development, William Beaumont General Hospital, El Paso, TX 79920). **Relationship between levels of chlorinated hydrocarbon insecticides in human milk and serum.** *Bull. Environ. Contam. Toxicol. 6(5): 449-452; 1971.* (11 references)

Since previous studies had revealed no correlation between plasma and milk levels of *p,p'*-DDE, and since serum *p,p'*-DDE level is employed in estimating chronicity of pesticide exposure, the present study was performed to determine levels of several organochlorine insecticides in milk and serum of a larger sample of women from different ecological areas. Twelve women were selected from an agricultural area, nine from a small city, and seven from a large city. Gas chromatography of the serum and milk samples revealed that all contained *p,p'*-DDE and *p,p'*-DDT, and most samples contained dieldrin and BHC. In addition, 11 women had traces of *o,p'*-DDT in either their serum or milk (range 0.5-3.4 ppb), and two women had traces of heptachlor epoxide (range 1.0-1.8 ppb) in both their milk and serum. Statistical analysis again failed to reveal any relationship between serum and milk levels of the insecticides.

72-0500. Zitko, V. (Fisheries Research Board of Canada, Biological Sta., St. Andrews, New Brunswick, Canada). **Polychlorinated biphenyls and organochlorine pesticides in some freshwater and marine fishes.** *Bull. Environ. Contam. Toxicol. 6(5): 464-470; 1971.* (12 references)

A method was developed for simultaneous cleanup and fractionation of fish tissue extracts for analysis of organochlorine pesticides and polychlorinated biphenyls (PCBs) and was applied to eel, pickerel, cod, hake, plaice, perch, mackerel, herring, mussels, and salmon from Canadian waters. The method entailed preliminary passage of the hexane extracts over an alumina column, followed by fractional elution from a silica gel column with hexane (fraction I), more hexane (fraction II), and hexane plus 10% ether (fraction III). Gas chromatography revealed that fraction I contains 70% of PCB, hexachlorobenzene, and aldrin; fraction II, remainder of PCB, heptachlor, and *p,p'*-DDE; while fraction III contains lindane, heptachlor epoxide, dieldrin, TDE, and *p,p'*-DDT. The PCB peaks did not coincide exactly with the Arochlor standard, and several unidentifiable peaks were found. The occurrence of higher PCB levels in pelagic fish rather than in groundfish indicates the possibility of aerial dissemination of PCB.

72-0501. Medovar, A. M. (Kiev Inst. Postgrad. Med., USSR). **Stoykost fosforoorganicheskikh pestitsidov vo vneshney srede. [The stability of organophosphorus pesticides in the environment.]** *Gig. Sanit. 36(10): 78-82; 1971.* (42 references) (Russian)

The factors affecting the amounts of organophosphorus pesticide residues occurring in the environment and in foods are reviewed and analyzed. Included are discussions on the physical and chemical characteristics of the pesticide and the technique of its application, the nature of the treated plant culture, and the impact of the meteorological conditions during and after treatment. Several milligrams of pesticide per kilogram of food product can be found during the first days following plant treatment. These residual levels decrease tenfold to hundredfold if the product was processed 2 weeks after plant treatment. Organophosphorus residues may persist up to 6 months at 0.1-0.01 mg/kg product levels. These residues may persist for several months to a year in the soil, and then transfer into beet roots or tuberous plants may occur. The stability of certain pesticides is particularly high in carrots. Reference is made to the presence of diazinon residues in flours from contaminated grains. Carbophos residues on storage grain were found to have maintained their insecticide properties for 5 months. Certain grains containing 3.3-3.6 mg/kg of carbophos produced flour with 2 mg/kg and bread with 0.1-0.4 mg/kg residues.

72-0502. Giovanoli-Jakubczak, T.; Fitak, B.; Chodkowski, J. (Dept. of Inorganic and Analytical Chemistry, School of Medicine, Warsaw, Poland). **Photolysis of Dipterex and DDVP under the influence of UV irradiation.** *Rocz. Chem. 45(4): 689-694; 1971.* (8 references)

The effect of UV radiation on the decomposition of Dipterex (*O,O*-dimethyl-2,2-dichlorovinyl phosphate, trichlorfon) was studied by polarography. It was shown that the first product of decomposition of Dipterex was DDVP (dichlorvos). Further irradiation reduces DDVP to numerous other polarographically active compounds, identification of which was found to be difficult. It was assumed that these products included *O*-methyl-2,2-dichlorovinyl phosphate, dichlorovinyl alcohol, dichloroacetaldehyde, dichloroacetic acid, and 2,2-dichloroethanol. These compounds, in addition to methylphosphates and inorganic phosphates, have previously been identified as products of an enzymatic decomposition of DDVP. These decomposition products can be reduced on a dropping mercury electrode.

72-0503. Leenheer, J. A.; Ahlrichs, J. L. (Dept. of Agronomy, Purdue Agricultural Experiment Sta., Lafayette, IN 47907). **A kinetic and equilibrium study of the adsorption of carbaryl and parathion upon soil organic matter surfaces.** *Soil Sci. Soc. Amer. Proc. 35(5): 700-705; 1971.* (13 references)

Two types of Indiana soil, a silty clay loam and a muck soil, were studied to elucidate the mechanism of carbaryl (1-naphthyl-*N*-methyl carbamate) and parathion (*O,O*-diethyl-*o,p*-nitrophenylphosphorothioate) adsorption on the organic matter. This involved a twofold study of both kinetic adsorption and equilibrium adsorption in nonflow aqueous systems. The differences in adsorptive characteristics of the various types of organic matter were small in both the kinetic and equilibrium studies, but changing the saturating cation from calcium to hydrogen greatly increased the adsorptive capacities for both insecticides. The magnitude of the adsorptive capacities was explained in terms of the magnitude of the hydrophobic natures of the insecticide adsorbates and the organic matter adsorbents. The adsorption mechanisms for carbaryl and parathion adsorption on soil organic matter adsorbents were found to involve pesticide transference rates of the solutes from solution to the surface of the adsorbents at initial times. This was followed by diffusion from exterior adsorption sites to the interior of the porous organic matter adsorbents at longer times. The fast adsorption rates, the low heats of adsorption, the reversibility of adsorption, and the high adsorptive capacities on hydrophobic surfaces tend to rule out chemisorption and point rather to physical adsorption with formation of Van der Waals bonds between hydrophobic portions of the adsorbate molecules and the adsorbent surface in aqueous systems.

See also 72-0432 72-0433 72-0436 72-0441 72-0444 72-0506 72-0563 72-0567 72-0577 72-0578 72-0580 72-0591 72-0596 72-0623 72-0629 72-0631 72-0638 72-0640 72-0641 72-0642 72-0643 72-0644 72-0647 72-0650 72-0653 72-0656 72-0658 72-0659

72-0504. Fisher, H. K.; Humphries, M.; Bails, R. (Div. of Respiratory Disease, Harborview Medical Center, 325 Ninth Ave., Seattle, WA 98104). **Paraquat poisoning. Recovery from renal and pulmonary damage.** *Ann. Intern. Med. 75(5): 731-736; 1971.* (23 references)

A 49-year-old man swallowed approximately 10 ml of Paraquat Dual (the dimethyl sulfate) and developed acute renal failure. Six days after the occurrence he was admitted to the hospital and treated with intravenous fluids and mannitol to increase urine flow, clear the solute, excrete the paraquat, and as a result the serum creatinine fell from 11.6 to 1.2 mg/100 ml. Peritoneal dialysis was not as effective in removing paraquat as urinary excretion. As a consequence of the poisoning, pleural effusions developed but pulmonary function tests showed no significant abnormality and by the time of discharge the effusions had subsided. This patient demonstrated that in spite of acute renal failure and pulmonary injury one can recover from paraquat poisoning. Oxygen therapy should not be utilized until the paraquat is completely removed from the body for fear of increased risk of lung injury.

72-0505. Hashimoto, Y. (Biological Research Lab., Nippon Soda Co., Ltd., Tokyo, Japan). **[Pre-clinical evaluation of detoxication of organic fluoride toxins.]** *Eisei Kagaku (Journal of Hygienic Chemistry), 17(6): 363-379; 1971.* (117 references) (Japanese)

A brief discussion of the use of fluoroacetic acid as a pesticide, and a brief history of studies on this acid are given. More detailed discussions include those of MNFA, comparative toxicity of MNFA, pre-clinical test of antidotes, fluoroacetic poisoning of men and antidote treatment, the mechanism of detoxication, and various experiments of fluoroacetic acid effects on the brains of mice. The effects that have been detected on men include: mild nausea, vomiting, headache, dizziness; medium ataxia, clouding of consciousness, epileptic convulsion, repetition of tonic and clonic convulsion, decrease in heart rate; and serious coma, cyanosis, lack of abdominal reflex, arrhythmia, increase of tracheal secretion, and hypotension. Clinical findings include: sudden decrease or increase of blood sugar, increase of hemogram leucocyte, increase of pseudo acidophils, lymphocytes, and decrease of electrolyte K. The blood pressure gradually decreases, and various types of premature beats, myocardial infarction, and coronary insufficiency are found on electrocardiogram, as the heart rate increases and respiration decreases. In hepatic function, GOT and GPT gradually or slightly increase. Electroencephalogram shows a slow malfunction, or irregular slow wave; when serious, a flat pattern appears. The body temperature increases temporarily and then gradually decreases. The article is a review of previously published material by other researchers.

72-0506. Wassermann, M.; Wassermann, D. (Occupational Health, Hebrew U., Hadassah Medical School, Jerusalem, Israel). **Biological effects of insecticides.** *Proc. Fourth Int. Congr. Rural Med.-Whither Rural Medicine? Edited by H. Kuroiwa et al. Jap. Ass. of Rural Med., Tokyo, Japan, 25-29; 1970.*

Organochlorine insecticide residue is stored in the adipose tissue and a higher amount of this residue is found in people over 45 yr. Men store more of this insecticide than women. It has been established that organochlorine insecticides are transmitted to the fetus through the placenta. Stored organochlorine insecticides do influence some homeostatic processes. They increase the level of drug-metabolizing enzymes in the liver microsomes. *P,p'*-DDT inhibits activation of antibody-forming cells. These insecticides produce changes in behavioral or nervous system function. Research is being conducted to find out more about the biologic effects of organochlorine insecticide storage on the living organism. Recommendations for eliminating these hazards are given.

72-0507. Longley, E. O.; Simpson, G. R. (New South Wales Div. of Occupational Health, 86-88 George Street, Sydney, N.S.W., Australia, 2001). **Acute methyl bromide poisoning.** *Proc. Fourth Int. Congr. Rural Med.-Whither Rural Medicine? Edited by H. Kuroiwa et al. Jap. Ass. of Rural Med., Tokyo, Japan, 32-33; 1970.*

During the course of the last few years methyl bromide has been widely used as a fumigant in New South Wales. Its uses vary from grain fumigation to total herbage destruction for golf and bowling greens. Severe poisoning can occur from even the slightest contact with methyl bromide gas. One such case has been reported. Following detachment of an applicator nozzle of a fire extinguisher an operator was subjected to splashing on the chest and neck by methyl bromide. The methyl bromide wet his clothes and he inhaled a good amount of gas. He immediately washed his skin and discarded the contaminated clothes and no irritation was felt. Two hours later he developed nausea and five hours later he felt a paralysis in his limbs. Within the next hour he entered the hospital and began to take seizures and it was not until the seventh day that they gradually disappeared. Ten days later he felt a spastic stiffness in both arms; two weeks later he took another fit. Even after six months his right arm was weak and myoclonic so that he could not feed himself. There seemed to be no pulmonary or renal involvement.

72-0508. Kundiev, U. I. (Research Inst. of Labor Health and Professional Diseases, Kiev, USSR). **Percutaneous absorbability of agricultural chemicals in current use.** *Proc. Fourth Int. Congr. Rural Med.-Whither Rural Medicine? Edited by H. Kuroiwa et al. Jap. Ass. of Rural Med., Tokyo, Japan, 34-35; 1970.*

There is a need to establish a connection between the degree of percutaneous activity of a pesticide and its chemical structure or its chemical or physical properties. Organophosphates are absorbed rapidly from the skin and reach the blood in a highly toxic form. In general, the higher the polarity of the molecule, the less it is absorbed through the epithelium. Research in the Soviet Union has been directed toward synthesizing new heterocyclics and dithiophosphates which are not absorbed as rapidly as existing compounds.

72-0509. Kaloyanova-Simeonova, F. P. (Inst. of Labor Protection and Occupational Health, Sofia, Bulgaria). **Prevention of intoxication by pesticides in Bulgaria.** *Proc. Fourth Int. Congr. Rural Med.-Whither Rural Medicine? Edited by H. Kuroiwa et al. Jap. Ass. of Rural Med., Tokyo, Japan, 35-37; 1970.*

Intoxication by pesticides, its causes, and prevention in Bulgaria are discussed. A great number of intoxications have been reported in the months when the fields are being sprayed. Workers come in contact with pesticide residues from the foliage of the sprayed plants days and weeks after they had been sprayed. Organophosphate pesticides (parathion, methyl parathion, mevinphos) cause the greatest number of intoxications (82.5%) followed by dinitroorthocresol (7%) and organochlorine preparations (heptachlor, DDT, dieldrin). Most of the intoxications are acute and transient. The average work loss is 1-3 days. The main causes of the intoxications are irregular use of the individual prevention measures and the insufficient hygiene measures taken by workers. Intoxication by pesticides can be best prevented by prohibiting the use of strong poisonous organophosphate pesticides, improvement of sanitary control in applying pesticides, exposure test expansion, and increasing the knowledge of pesticides and their use.

72-0510. Ueda, K.; Kawai, M. (Tokyo Dental College, Tokyo, Japan). **Therapy of organophosphate poisoning with oxime antidote and glutathione.** *Proc. Fourth Int. Congr. Rural Med.-Whither Rural Medicine? Edited by H. Kuroiwa et al. Jap. Ass. of Rural Med., Tokyo, Japan, 38-39; 1970.*

Glutathione has been tested for therapy in methyl bromide poisoning and the joint administration of oxime antidote and glutathione for the treatment of organophosphate poisoning. The chances for the future of these treatments are good but experimentation is still in the preliminary phase. Before recommendation for routine use can be established, the effects in large animals as well as in humans must be confirmed.

72-0511. Matsushima, S. (Saku Central Hospital, Nagano Pref., Japan). **A statistical study on clinical cases of pesticide poisoning in rural districts.** *Proc. Fourth Int. Congr. Rural Med.-Whither Rural Medicine? Edited by H. Kuroiwa et al. Jap. Ass. of Rural Med., Tokyo, Japan, 42-45; 1970.*

A survey was conducted in Japan by the Japanese Association of Rural Medicine on the number of pesticide poisonings. In the past two years 649 patients suffered from pesticide poisoning; 466 cases (71.7%) were due to spraying, 92 were caused at other times, 27 were from misuse, and 59 were homicide and suicide cases. The types of pesticides which caused the accidents were highly toxic organophosphates (21.6%), antibiotics (11.1%), chlorinated hydrocarbons (9.7%), and low toxicity organophosphates (9.2%). In 1968 the pesticide which caused the greatest number of accidents was Difolatan. The main causes for the poisonings were due to lack of protection on the part of the user during the spraying, carelessness, and poor health. To prevent further cases of poisoning greater care has to be taken in using the pesticide and low-toxicity pesticides will have to be used.

72-0512. Watanobe, S. (Watonobe Medical Hospital, Aomori Pref., Japan). **Systematic study on poisoning of parathion in pesticide.** *Proc. Fourth Int. Congr. Rural Med.-Whither Rural Medicine? Edited by H. Kuroiwa et al. Jap. Ass. of Rural Med., Tokyo, Japan, 45-47; 1970.*

A 15-yr study of parathion poisoning was conducted to research on the influence of parathion to humans during the spraying season, its accumulation and relation to the farmhands' disease, and the possibility of public hazard. The results show that parathion is hazardous to health during spraying and many weeks later. Some of the symptoms are latent due to the individual but the poison will eventually manifest itself. Not only those farmers were affected who did the spraying but also those who lived on the apple farms where the spraying was done. Parathion is very useful in giving a good apple harvest, but its public hazard problem deserves more attention.

72-0513. Sugaya, T. (Hiraka General Hospital, Akita Pref., Japan). **Studies on pesticide poisoning among farmers.** *Proc. Fourth Int. Congr. Rural Med.-Whither Rural Medicine? Edited by H. Kuroiwa et al. Jap. Ass. of Rural Med., Tokyo, Japan, 47-48; 1970.*

In Japan, because of the difficult conditions under which farmers have to work, agricultural chemicals are widely used. This increases production but also causes acute and chronic pesticide poisoning. The percentage of people reporting symptoms of poisoning rose from 42.3% in 1966 to 64.0% in 1968. The symptoms vary according to the pesticide used. Headaches, dullness of the body, and loss of appetite are caused by organophosphorus insecticides and organochlorine insecticides. Hyperemia of conjunctiva, itchy feeling of skin and nose, and pharynx pains are indicative of organochlorine insecticides, organic sulfur compounds and agricultural antibiotics. The workers in orchards suffered more than

those in the paddy fields because of the frequency of spraying and the different methods used. Because of these results, possible methods of preventing pesticide poisoning are urgently needed.

72-0514. Izumiyama, T.; Nagata, H.; Kamata, K.; Kono, S. (Hokushin General Hospital, Nagano Pref., Japan). **Health injury of operators of "Speed-Sprayer" due to poisoning by organophosphorus pesticides in apple orchards.** *Proc. Fourth Int. Congr. Rural Med.-Whither Rural Medicine? Edited by H. Kuroiwa et al. Jap. Ass. of Rural Med., Tokyo, Japan, 49-52; 1970.*

In 1960 the "Speed-Sprayer" was introduced in Japan to the fruit growers and since has been extensively used to apply pesticides. This has caused a great health hazard because all the safety measures were not obeyed (wearing of masks, gargling after spraying, washing the body thoroughly). Research was conducted over a period of four years. After the spraying period the workers were examined and general medical examination did not show signs of abnormality, however, as parathion is converted to paraoxon *in vivo*, continued spraying will lead to liver damage. During the spraying season the cholinesterase level in normal cases fell significantly indicating pesticide poisoning. Health programs were undertaken to inform the speed-sprayers of how to avoid poisoning and the next year there was a 39.7% improvement. To further decrease poisoning, highly toxic organophosphorus pesticides have been replaced by low toxic ones and the use of parathion has been prohibited.

72-0515. Arimatsu, Y.; Nomura, S.; Takamatsu, M. (Kumamoto U. Medical School, Kumamoto Pref., Japan.) **Study on skin hazards caused by new fungicide Difolatan used in tangerine orchards.** *Proc. Fourth Int. Congr. Rural Med.-Whither Rural Medicine? Edited by H. Kuroiwa et al. Jap. Ass. of Rural Med., Tokyo, Japan, 52-55; 1970.*

Farmers who were using the new fungicide Difolatan on their tangerines were found to suffer from acute dermatitis ranging from slight to severe. Alkaline hydrolysis of the fungicide yielded 26 fractions by TLC. Patch tests on human skin revealed that four of these compounds were irritants. The most toxic substance was isolated from these four fractions, crystallized to a melting point of 109°-100°C. Data on elementary analyses of the crystal and infrared absorption indicate the formula C4 H O2 S2 Cl3. Three possible structures were postulated.

72-0516. Kambe, Y.; Matsushima, S.; Kuroume, T.; Suzuki, S. (Saku Central Hospital, Nagano Pref., Japan). **Studies on patch tests in contact dermatitis caused by pesticides.** *Proc. Fourth Int. Congr. Rural Med.-Whither, Rural Medicine? Edited by H. Kuroiwa et al. Jap. Ass. of Rural Med., Tokyo, Japan, 55-57; 1970.*

Contact dermatitis caused by pesticides among farmers was reported in Japan which seemed to be produced by an allergic mechanism. Eighteen patients were given a patch test using suspected allergenic pesticides. After 24 hr a positive reaction occurred in 12 out of the 18 patients including seven having a reaction to chlorinated hydrocarbons, six to organic sulfur, two to organophosphates, two to phenyl mercuric acetate, one to copper sulfate and one to Dyrene. The control cases only indicated 3 out of 12 positive reactions. The skin window technique was applied to confirm the positive tests as being allergic in nature. Five cases were tested and results varied in each individual suggesting the importance of reexamining pesticide poisoning as a possible allergy.

72-0517. Imaizumi, K.; Atsumi, K.; Horie, E.; Mita, K.; Takano, Y.; Goto, J.; Nakamura, T.; Ishii, K. (School of Medicine, Iwate Medical U., Iwate Pref., Japan.) **Ophthalmic disturbances due to agricultural chemicals in Japan.** *Proc. Fourth Int. Congr. Rural Med.-Whither Rural Medicine? Edited by H. Kuroiwa et al. Jap. Ass. of Rural Med., Tokyo, Japan, 57-59; 1970.*

Eye lesions have been reported in Japan to be caused by DDT and inorganic chemicals such as calcium nitrate, ammonium sulfate, calcium super phosphate or lead arsenate and more severe acute general toxication by organophosphate compounds. A newly developed chemical compound, Blasticidin-S, caused eye ailments in 34.2% of its users. Miosis is one of the typical symptoms of these pesticide poisonings. To prevent these diseases the toxicity of the chemicals used must be lowered and necessary safety precautions must be followed.

72-0518. Kagan, Y. C.; Panshina, T. N.; Rodionov, G. A.; Vigovskaya, L. I.; Danilenko, L. P.; Evreev, V. N.; Ershova, E. A.; Lyubenko, P. A.; Matyushina, V. I.; Maniko, N. N.; Medovar, A. M.; Sasinovich, L. M. (Soviet Research Inst. of Hygiene and Toxicology of Pesticides and Polymeric and Plastic Masses, Kiev, USSR). **Data on toxicology of organophosphorus tick insecticides and experimental treatment of their poisoning.** *Proc. Fourth Int. Congr. Rural Med.-Whither Rural Medicine? Edited by H. Kuroiwa et al. Jap. Ass. of Rural Med., Tokyo, Japan, 63; 1970.*

Data on the toxicity of organophosphorus insecticides used in the USSR is reported. The insecticides which go in through the mouth, the skin and the respiratory organs are of concern. The effects of organochlorine insecticides on the central nervous system, components of blood and body fluids, endocrine glands, liver, kidney, and other organs are also of great importance. These insecticides are classified according to toxicity and action. The maximum permissible concentration of these pesticides in air and foods is established. The agricultural application of organophosphorus insecticides is also discussed. Ways of treating organophosphorus poisoning were studied.

72-0519. Mihail, G.; Bodnar, J.; Zlavog, A.; Branisteanu, D.; Mihaila, D.; Ambrono, V. (Inst. of Hygiene, Jassy, Rumania). **Researches concerning the exposure risk and the toxicology of one dithiocarbamic fungicide.** *Proc. Fourth Int. Congr. Rural Med.-Whither Rural Medicine? Edited by H. Kuroiwa et al. Jap. Ass. of Rural Med., Tokyo, Japan, 63; 1970.*

Data are presented on the exposure risk from the dithiocarbamic fungicide TMTD (tetramethyl-thiuram-disulphide) which is used as a seed treatment for wheat and maize (corn). Air concentrate of TMTD varied be-between 15-20 mg/m^3 and skin residues were between 5-28 μg/cm. Concomitant appearance of some irritative, hematological alterations (leukopenia) and several cases of acute alcohol intolerance suggested a similarity between TMTD intoxication and carbon disulphide poisoning. Consequently these two chemicals were compared by administering intramuscularly 10 mg/kg/wk of CS2 to a group of ten rabbits for two months and a second group with an equal amount of TMTD. During this period the behavioral and biochemical indices showed that a greater similarily existed between the two chemicals than previously expected. This was evidenced by a hyperlipemic syndrome accompanied by blockage of the SH group of serum enzymes, a depletion of serum copper, and inhibition of cellular respiration in liver, kidney, and brain.

72-0520. Anonymous. **Pesticide poisoning remains a major problem.** *J. Amer. Med. Ass. 217(10): 1315, 1319; 1970.*

Twelve percent of the chemically caused deaths a year are related to pesticides. Organophosphorus compounds, although non-toxic in themselves, are similar to nerve gas and become deadly poisonous in the body. If parathion is oxidized to paraoxon, acetylcholinesterase production is inhibited thus acetylcholine accumulates quickly to the point of intoxication. Some of the symptoms are tearing, nasal congestion, hypersecretion in bronchospasm and dyspnea, and bradycardia; large doses can cause death. Large doses of atropine are recommended after cyanosis is overcome followed by a dose twice as much of metaraminol to lessen the side-effects of atropine and finally followed by pyridine aldoxime at the recommended dose of 1 g every 12 hr. The combination of these doses is called "AMP therapy" which is the best for organophosphorus poisoning. Not all individuals react to pesticides in the same manner. Female rats over 30 days convert parathion to paraoxon more rapidly. Some pesticides become more toxic after exposure to visible and ultraviolet light. The method of storage might also influence toxicity.

72-0521. Karlsson, L.; Rosen, E. (Dept. of Inorganic Chemistry, U. of Umea, Umea, Sweden). **On the thermal destruction of polychlorinated biphenyls (PCB). Some equilibrium considerations.** *Chem. Scr. 1(2): 61-63; 1971.* (6 references)

Experiments have been conducted on the possible thermal destruction of PCB. Equilibrium calculations have been performed in order to obtain quantitative information about the amounts of the different species formed. These have been conducted in the temperature range 1000-1500°K for a process where PCB undergoes combustion with various amounts of air. Carbon and the gaseous species carbon monoxide, carbon dioxide, HCl and chlorine are the main products. However, the amounts of the corrosive species HCl and chlorine can be considerably reduced by addition of excess calcium carbonate and sodium carbonate.

72-0522. Mc Leod, J. G. (Dept. of Medicine, U. of Sydney, NSW 2006, Australia). **Peripheral neuropathy caused by drugs and toxic substances.** *Aust. N. Z. J. Med. 3: 268-269; 1971.* (9 references)

Peripheral neuropathy may be caused by a number of toxic chemicals including lead, arsenic, mercury, thallium, acrylamide, organophosphates, PCP, DDT, and 2,4-D. The relationship between these chemicals and peripheral neuropathy is not easily established; however, degree of exposure, time of onset of symptoms, and nature of neurological symptoms may be of help. These toxic substances all have an individual effect; organophosphates may cause a spastic paraparesis and may also involve the peripheral nerves. Most of these compounds interfere with the metabolism of the nerve cell and pathological changes in the nerve cell occur. Pathological studies and electrophysiological techniques are important in assisting to establish the nature of the underlying disorder.

72-0523. Working Group on Pesticides, Washington, D.C. (CS-22, Parklawn Bldg., 5600 Fishers Lane, Rockville, MD 20852). **Ground disposal of pesticides: the problem and criteria for guidelines.** *Report Number WGP-DR-1, March 1970. 53 p. (Distributed by National Technical Information Service, Springfield, VA 22151, as PB 197 144.)*

One of a series of periodic reports on the efforts of the Working Group on Pesticides, this document is focused on the criteria for the selection of sites and procedures for disposal of large volumes of pesticide wastes. Discussions of the general characteristics of interactions between pesticides and soils and pesticides and ground water are followed by a description of criteria for the decision to dispose of pesticide wastes to the subsurface and selection of a disposal zone. A decision matrix for consideration of the factors involved in pesticide disposal in their proper sequence will aid in the gathering of information regarding disposal sites, as well as in the establishment of guidelines regulating disposal. The broad membership of the Working Group on Pesticides provides for balanced consideration of the sources of pesticides to be disposed of and methods of ground disposal.

72-0524. Working Group on Pesticides, Washington, D.C. (CS-22, Parklawn Bldg., 5600 Fishers Lane, Rockville, MD 20852). **Information available on disposal of surplus pesticides, empty containers and emergency situations.** *Report Number WGP-DR-3, Sept. 1970. 58 p. (Distributed by National Technical Information Service, Springfield, VA 22151, as PB 197 146.)* (93 references)

This report consists of five rather loosely related chapters dealing with storage, handling, and disposal of pesticides and containers, and handling of emergency situations involving pesticides. The problems and proposed solutions in pesticide disposal are discussed in the first chapter, which contains lists of manufacturers of incinerators and flue-gas equipment. Chapter 2 lists barrel manufacturers with equipment for decontamination of empty pesticide drums by incineration. The third chapter is primarily oriented toward safe home use of pesticides, but also features a discussion of fire and explosion hazards. The fourth chapter lists general principles for coping with pesticide spillage in accidents, and chapter 5 provides a convenient form for gathering the names and means of contacting agencies available for emergency assistance.

72-0525. Working Group on Pesticides, Washington, D.C. (CS-22, Parklawn Bldg., 5600 Fishers Lane, Rockville, MD 20852). **Summary of interim guidelines for disposal of surplus or waste pesticides and pesticide containers.** *Report Number WGP-DS-1, Dec. 1970. 25 p. (Distributed by National Technical Information Service, Springfield, VA 22151, as PB 197 147).*

These interim guidelines for disposal of waste pesticides and pesticide containers are based on the three previous reports of the Working Group on Pesticides. Intended for ready reference rather than for use as specific recommendations, the guidelines are arranged for the convenience of potential users: householders, small and large farm operators, commercial applicators, and industrial formulators. Small users are generally referred to their local responsible agency (county agents, etc.), whereas possible alternative disposal modes are discussed for the benefit of those encountering large quantities of waste pesticides or containers. Systems for collecting surplus pesticides and containers, and for storage prior to disposal are discussed.

72-0526. Matthew, H.; Wright, N.; Robson, J. S.; Flenley, D. C.; Brown, S. S.; Heard, B. E.; Housley, E.; Swan, A. A. B.; Kennedy, W. P. U.; Donald, K. W.; McHardy, G. J. R.; Prescott, L. F. (Regional Poisoning Treatment Centre, Royal Infirmary, Edinburgh, Scotland). **Paraquat poisoning; clinopathological conference.** *Scot. Med. J. 16: 407-421; 1971.* (6 references)

A clinopathological conference of medical specialists was called to discuss a fatal case of paraquat poisoning. The patient, a healthy 46-year-old woman, unintentionally drank less than 20 ml of a 20% paraquat solution on an empty stomach. She was hospitalized on the fourth day with dyspnea and abdominal pain. An attempt at forced diuresis on the fifth day was unsuccessful; after cyanosis developed, oxygen administration was begun. Signs of pulmonary edema combined with severe oliguria were taken as indications for hemodialysis, which provided only temporary improvement. Further clinical deterioration, featuring uncontrollable asphyxia, resulted in death on the 12th day. A summary of blood gas values throughout the hospitalization period is presented. Autopsy revealed, on macroscopic examination, a shrunken lung with fibrosis and obliteration of alveoli. Edema and hemorrhage were evident histologically. Focal renal tubular necrosis was present; the brain was congested, but without apparent anoxic damage. A resemblance to signs of oxygen toxicity was discussed in connection with possible paraquat potentiation of oxygen effects. Positive pressure ventilation with air was proposed as an alternative. Comparison with four other cases, in three of which the victims survived, brought out the possible significance of differences in intestinal resorption conditions.

72-0527. Regnier, Jr., A. V.; Cranmer, M. F.; Lacomba, J. R.; Velazquez, C.; Schoof, H. F. (Center for Disease Control, U. S. Public Health Service, Savannah, GA 31402). **Field studies of Gardona against *Aedes aegypti* in Puerto Rico.** *Mosquito News 31(3): 360-370; 1971.* (6 references)

Three municipios in Puerto Rico, previously untreated by the *Aedes aegypti* eradication program, were selected for spraying with Gardona to determine its practical effectiveness in reducing mosquito breeding. Reduced breeding in water-containing vessels was observed with 1.25 and 2.5% Gardona suspensions. No adverse effects were noted in the treating personnel. One finding of depressed cholinesterase levels in two packagers was subsequently interpreted as artifactual. The obeservation of greater numbers of larvae in untreated vessels within treated areas in contrast to untreated areas suggests that treatment with Gardona might repel ovipositing female mosquitoes. The large number of new, untreated containers found at each inspection indicates that sanitation measures aimed at removing such containers might give the chemical eradication procedures a far better chance of success.

72-0528. Brown, H. W. (619 South Canyon St., Nampa, ID 83651). **Electroencephalographic changes and disturbance of brain function following human organophosphate exposure.** *Northwest Med. 70(12): 845-846; 1971.* (9 references)

The resemblance between symptoms and EEG findings in organophosphate poisoning and temporal lobe epilepsy is discussed on the basis of two cases of mild accidental parathion poisoning in man. The disorientation in space and time, depersonalization and hallucinations, recorded in the organophosphate-poisoned patients along with visual disturbances and muscular pain, were reminiscent of those occurring during the aura of a temporal lobe seizure as well as following ingestion of LSD, a pseudocholinesterase inhibitor.

72-0529. National Milk Producers Federation. (Author address not given). **A "safe-use" insecticide guide for dairymen.** *Hoard's Dairyman 116(1): 621; 1971.*

A list of insecticides which are safe for use on dairy farms, compiled by the National Milk Producers Federation, specifies the areas which are suitable for use of each type and brief directions for application. Also listed are precautions for avoiding contamination of milk and feeds.

72-0530. Iwasaki, I.; Nawa, H.; Hara, A.; Takagi, S.; Hyodo, K. (Okayama, Japan). **Agricultural organofluoride poisoning: I. Carbohydrate metabolism.** *Fluoride 3(3): 121-127; 1970.* (1 reference)

There is a close association between organofluoride (MNFA) intoxication and an abnormal carbohydrate metabolism. Due to the blockage of the Krebs cycle, glucose is quickly changed into lactic acid via pyruvic acid which results in hypoglycemia. A very effective treatment of organofluoride poisoning is intravenous injection of glucose.

72-0531. Iwasaki, I.; Namba, M.; Nawa, H.; Hara, A.; Tagaki, S.; Hyodo, K. (Okayama, Japan). **Studies on organofluoride poisoning IV. Electroencephalographic (EEG) observations.** *Fluoride 3(3): 133-136; 1970.*

Patients suffering from severe organofluoride intoxication (MNFA, Oxylan) were treated with glucose. Prior to treatment the electroencephalograms (EEG) demonstrated flat curves. Dysrhythmic patterns were observed in less severely affected patients which suggest the presence of impaired cerebral function associated with abnormal carbohydrate metabolism. The appearance of paroxysmal waves is also indicative of organofluoride poisoning. It is evident that EEG findings are valuable in the prognostic evaluation and diagnosis of organofluoride poisoning.

72-0532. Nowak, W.; Lotocki, W.; Szrzedzinski, J.; Stasiewicz, A.; Badurski, J. (Inst. of Internal Diseases, Bialystok, Poland). **Zatrucie dieldryna podczas ciazy. [Dieldrin poisoning during pregnancy.]** *Pol. Tyg. Lek. 25: 958-959; 1971.* (8 references) (Polish)

A woman in the fourth month of pregnancy tried to commit suicide by ingesting nearly 20 g of Alvitt 55 (90% dieldrin). This dose is considered lethal by many authors. The woman regained consciousness after five days and had a slow recovery. On the 21st day after the ingestion of the poison the fetus was removed by Caesarean section. The dieldrin content in the placenta and viscera of the fetus was determined. The kidney and perirenal tissue contained most of the dieldrin. It is believed that the patient survived only because of the high storage of the poison in the placenta and viscera of the fetus.

72-0533. Trebicka-Kwiatkowska, B.; Radomanski, T.; Stec, J. (Kliniki Poloznictwa i Chorob Kobiecych AM, Lublin, Poland). **Przypadek ciazy obumarlej u kobiety stykajacej sie zawodowo z pestycydami. [A case of intrauterine fetal death in a woman exposed to pesticides during her work.]** *Pol. Tyg. Lek. 48: 1862-1863; 1971.* (10 references) (Polish)

An intrauterine fetal death occurred in a woman exposed to concentrations of DDT and DDE during work. Determinations of the quantities of DDT and DDE in the blood and placenta indicated that the levels for these pesticides were considerably higher in comparison with the results of examinations of country women who gave birth to healthy children. It was suggested that the intrauterine death of the fetus was caused directly by the toxic influence of the pesticides.

72-0534. Anonymous. **Disposing of unwanted DDT.** *Int. Pest Control 13(4): 7; 1971.*

The Canadian Department of National Defense has opened a plant for the safe disposal of DDT combinations. The DDT formulations are injected into the system, atomized in a high-temperature refractory where complete combustion occurs. At the top of the tower, water coolant is introduced through a filter. The products leave the system as a safe dilute acid. DDT will be destroyed continuously at the rate of 100 gal/hr.

72-0535. Wilhelm, A.; Thiemann, K.-G. (Veterinaeruntersuchungs- und Tiergesundheitsamt, Cottbus, Germany). **Natriumchlorat als Ursache einer Vergiftung bei Schafen. [Sodium chlorate poisoning in sheep.]** *Monatsh. Veterinaermed. 24: 415-417; 1969.* (4 references) (German)

Carelessness on the part of an agricultural chemicals supplier, who labeled a can of sodium chlorate intended for herbicidal use only as "salt for the shepherd", resulted in several deaths in a herd of sheep to which the material was offered as feed salt. Observation of a dark brown coloration of the blood of dead sheep resulted in the diagnosis of methemoglobinemia due to chlorate poisoning. Pathological-anatomical examination of dead sheep revealed inflammatory and hemorrhagic changes in the major organs; histological examination showed signs of hypoxic parenchymal degeneration. Chlorate ion was detected chemically in urine and feces. The methemoglobin fraction in the blood samples investigated was 70-80%. The dark brown coloration of the urine in experimentally poisoned sheep was also noted.

72-0536. Likosky, W. H.; Hinman, A. R.; Barthel, W. F. (Atlanta, GA). **Organic mercury poisoning, New Mexico.** *Neurology 20: 401; 1970.*

The development of symptoms of organic mercury poisoning in three members of a New Mexico family was traced to the use of seed grain treated with methyl mer-

cury dicyandiamide as hog feed. Fourteen hogs fed large quantities of this grain with their diet developed gait disturbances and became blind; twelve of these died. High mercury concentrations were found in the treated seed grain, leftover pork, and specimens from the three affected as well as the four unaffected members of the family who had eaten the pork. Administration of British Anti-Lewisite produced some improvement in the least severely affected one of the three symptomatic family members.

72-0537. Mickleson, K. N. P.; Fulton, D. B. (Palmerston North Hospital, Palmerston North, New Zealand). **Paraquat poisoning treated by a replacement blood transfusion: case report.** *N. Z. Med. J. 74(470): 26-27; 1971.* (4 references)

A 5-yr-old boy drank about 140 ml of a paraquat solution. He was admitted to the hospital and gastric lavage was carried out. Two hours later a replacement blood transfusion was performed which removed about 280 mg of the poison from the body. Forced diuresis is the usual procedure for paraquat poisoning; however, replacement blood transfusion enhances the effectiveness of forced diuresis. Replacement blood transfusion can be substituted for hemodialysis when facilities for the latter are not available.

72-0538. Schmidlin-Meszaros, J.; Romann, E. (Kantonales Laboratorium, Zurich, Switzerland). **Eine accidentelle Vergiftung von Kuehen mit Endosulfan (Thiodan). [An accidental poisoning of cows by endosulfan (thiodan).]** *Mitt. Gebiete Lebensmittel. Hyg. 62(2): 110-122; 1971.* (29 references) (German)

Three cows were accidentally poisoned with endosulfan. Endosulfan-emulsion spray (35%) was used as treatment for the extermination of the june bug along the edge of the woods; as a result the hay fodder was found to be contaminated. Endosulfan was identified and assayed by gas chromatography, vacuum sublimation and IR spectrometry. The results are discussed and compared with those of the toxicological literature.

72-0539. Moriarty, F. (Monks Wood Experimental Station, Abbots Ripton, Huntingdon, England). **Prediction of adverse effects on wildlife by pollutants.** *Meded. Fac. Landbouwwetensch. 36(1): 27-33; 1971.* (23 references)

Adverse effects of environmental pollutants on wildlife are extremely difficult to predict from observations and experiments in the field, because these effects are usually sublethal and therefore difficult to detect. Studies in sublethal effects should be concerned with determining the minimum dose and integrating this with the different internal and external environments. Death is the end-result of a sequence of biochemical disorders which starts when molecules of insecticide produce a specific biochemical lesion at the site of the action. Comparisons of resistant and susceptible strains of insects, and study of synergists, lead to the clear inference that a reduction in the number of molecules available for the site of action reduces toxicity. It can be assumed that sublethal effects are initiated by lesser disturbances at the same site of action, so that sublethal effects should be most pronounced with doses that are almost, but not quite, lethal, and to decrease as the dose decreases. This suggests that as a general rule, those individuals with the highest internal concentrations of insecticide will be the most prone to sublethal effects. Answers can be obtained from knowledge of the biochemical lesions, which will suggest the systems that are affected first. One could then select aspects of these systems that are suitable for laboratory experiments. Experiments should be made on species in which the pollutant is relatively persistent.

72-0540. Koeman, J. H.; Garssen-Hoekstra, J.; Pels, E.; de Goeij, J. J. M. (Inst. of Veterinary Pharmacology and Toxicology, Utrecht, The Netherlands). **Poisoning of birds of prey by methyl mercury compounds.** *Meded. Fac. Landbouwwetensch. 36(1): 43-49; 1971.* (4 references)

Evidence concerning increased mortality of birds of prey in Sweden indicated that poison other than aldrin and dieldrin might be responsible. Preliminary analysis showed mercury levels to range from 65 to 125 ppm, which equaled the range of levels found in birds experimentally poisoned by methylmercurydicyandiamide. Results are reported from experiments to determine the agricultural dose rate which could kill a bird of prey indirectly and the levels in experimentally poisoned birds of prey at the moment that serious symptoms develop. Male and female falcons were fed with mice poisoned with known amounts of methylmercurydicyanadiamide. The first conclusion was that birds of prey can be poisoned indirectly by mice treated with 24 ppm of a methylmercury compound in their diet, which approximates the concentration used for the treatment of cereals. Distribution of mercury in different organs was studied and found to be rather even throughout the body; this is characteristic of alkylmercury compounds. Mercury was analyzed by neutron activation. When liver and brain residues of 34 birds of prey and owls found dead in 1968 and 1969 were compared with the test results, no definite conclusion could be made on the proportion of dead birds actually killed by methylmercury compounds. It was obvious, however, that quite a number of the 34 must have been killed by these fungicides during this period.

72-0541. Tejning, S. (Dept. of Occupational Medicine, University Hosp., S 220 05 Lund 5, Sweden). **Biological effects of methyl and ethyl mercury compounds used as disinfectants for seed-grain on domestic and wild life.** *Meded. Fac. Landbouwwetensch. 36(1): 50-57; 1971.* (14 references)

Historical developments in alkylmercury-compound-pollution in Sweden were reviewed starting with 1940, when methyl and ethylmercury compounds were introduced as fungicides in the disinfection of seed-grain. Avifuana, mammalian predators, and birds of prey sustained high mortality. It was then found that Swedish commercial eggs had on the average three times more mercury than eggs from other European countries. Experiments are described which showed a curvilinear relationship between the amount of ingested mercury and mercury eliminated within the eggs, but there was no correlation between the manifestation of symptoms and the mercury content of the brain. Recent experimental and clinical studies in Sweden have now proved that methylmercury (and also phenylmercury) compounds cause genetic disorders. Even at exceedingly low concentrations, methylmercury causes inactivation of the spindle and deviating chromosome numbers, as well as chromosome breakages in the roots of onions. Poorly distributed sex chromosomes in females, developmental disturbances, and an increase in exceptional offspring were observed with methylmercury poisoning in *Drosophila*. The problem of alkylmercury poisoning in domestic animals and wildlife is on the decline in Sweden after the prohibition in 1966 of the use of methyl and ethylmercury compounds as fungicides for seed-dressing.

72-0542. Buchel, L. (Institut de Pharmacologie, 15, rue de l'Ecole-de-Medecine, Paris, France) **Contribution a l'etude du metabolisme de la zoxazolamine chez les rongeurs. [A contribution to the study of zoxazolamine metabolism in rodents.]** *Arch. Sci. Physiol. 25: 19-45; 1971.* (30 references) (French)

Zoxazolamine is a substance known to cause paralysis. In men and dogs, zoxazolamine is metabolized primarily into pharmacologically inactive 6-hydroxyzoxazolamine and the myorelaxant chlorozoxazone. *In vivo* experiments were carried out to study the mechanism of action of zoxazolamine and its metabolism as affected by sex, age and ambient temperature in mice and rats. Zoxazolamine was analyzed in blood, tissues, and the cerebrospinal axis of the test animals as a function of time. *In vivo* experiments were performed in rats to investigate the effect of chlordane on the distribution and metabolism of zoxazolamine. Here zoxazolamine did not result in any enzymatic activation. The experiments revealed that in mice and rats, the duration of the paralysis is independent of the sex, but dependent on the ambient temperature. The age of the test animal also influenced the effect of zoxazolamine. Zoxazolamine concentrations in blood were less than those in cerebrum and spina. In rats treated with chlordane, shorter paralysis durations and accelerated zoxazolamine catabolism were observed.

72-0543. Vernik, A. Y. (Dept. of Neurology and Psychiatry, Petrozavodsk U., USSR). **Khlorofosnyy polinevrit. [Polyneuritis from chlorophos.]** *Sov. Med. 9: 44-45; 1971.* (6 references) (Russian)

Acute poisoning with chlorophos following suicidal attempts in five patients and following accidental intake in another patient is reported. The pathology of this condition can be considered in terms of several stages: coma (first day); a stage of severe visceral disorder (the second and third days); psychomotor disorders (the fourth and fifth day); relative well-being between the seventh and 17th days; and polyneuritis, starting from the 16th day following poison intake. The initial stage of polyneuritis is characterized by pain in the distal portions of the limbs along with functional alterations of the motor nerves. Weak paralysis of the wrists and feet develops symmetrically 15 days later, along with minor alterations of the tactile function. Polyneuritis from chlorophos may assume long-lasting severe forms and leave permanent sequelae. The delayed onset of polyneuritis is indicative of its association with alterations occurring at the vitamin B absorption level due to the liver injury induced by the pesticide. Development of polyneuritis is enhanced by alcohol intoxication. Anticholinesterase preparations should be avoided in the treatment of chlorophos-induced polyneuritis. Limitations on the commercial availability of chlorophos should be applied in order to decrease the rate of similar poisoning.

72-0544. Beebeejaun, A. R.; Beevers, G.; Rogers, W. N. (St. Helier Hospital, Carshalton, England). **Paraquat poisoning—prolonged excretion.** *Clin. Toxicol. 4(3): 397-407; 1971.* (16 references)

A patient who ingested paraquat developed transient renal failure and pulmonary damage. Notwithstanding forced diuresis, paraquat was found in the urine for 26 days. Her death after 46 days was not directly related to the poisoning. The course of her illness and biopsies of lung, kidney, and liver are reported together with the post-mortem. (Author abstract by permission).

72-0545. Zorin, P. M. (Dept. of Dermatology, Akhtyr Med. Center, USSR). **Allergicheskiy dermatit, voznikshiy v rezultate kontakta s tsinebom. [Allergic dermatitis from zineb.]** *Vestn. Dermatol. Venerol. 44(2): 65-68; 1970.* (2 references) (Russian)

Zineb applied in 0.5% water suspension to tobacco fields induced contact dermatitis in 86 workers involved in various activities 2 to 15 days after spraying. Youngsters and women below the age of 22 years appeared to be the category most susceptible to this agent. Moisture appeared to be a promoting factor in the development of the disease. Hyperemia, vesicular rush, and edema constituted the clinical features of the disorder, which lasted between 5 and 15 days. Boric acid, potassium permanganate, or rivanol solutions were among the remedies applied topically, along with sedatives and desensitizers administered otherwise. Cutaneous tests carried out in

former patients for the evaluation of allergic action of zineb were positive in 41 out of 54 cases, indicating that recurrent exposure to the agent may induce allergic dermatitis. Teen-age youngsters and young women, as well as former zineb dermatitis patients, should not be allowed to work in fields that have been treated recently with zineb. Protective equipment including long aprons, oversleeves, stockings, and gloves made of dense fabrics constitutes part of the prophylactic measures to be applied to prevent dermatitis from zineb.

72-0546. Vanat, S. V.; Vanat, I. M. (Central County Hosp., Terebovlyansk, Ternopol Region, USSR). **K voprosu o toksiko-allergicheskoy reaktsii, vyzvannoy DDT. [Contribution to the toxic-allergic reaction induced by DDT.]** *Klin. Med. (Moscow) 49: 126-127; 1971.* (7 references) (Russian)

A case of severe poisoning with DDT developed by a 46-yr-old woman while working in a field which had been treated with the pesticide the previous day is presented. The patient complained of breathing difficulties, chest pain, and overall weakness starting 1 hr after the beginning of her work. Swelling of lips and eyelids developed 5 hr later. High temperature, swelling of the whole facial and neck surface with hyperemia, and swelling of the wrists appeared on the second day of the disease. High doses of corticosteroid hormones and desensitization therapy led to full recovery 18 days after the onset of the disease. The cutaneous test carried out with a 10% suspension of DDT before the patient's release was positive, indicating that DDT may produce severe allergic reactions in certain cases.

72-0547. Simkin, A. Z.; Mironov, Y. P. (Central County Hosp., Serpukhov, USSR). **Ostroye otravleniye khlorofosom. [Acute poisoning with chlorophos.]** *Klin. Med. (Moscow) 49: 133-134; 1971.* (Russian)

An episode of acute chlorophos poisoning in a group of workers, 25 to 52 years of age, which occurred while working in fields treated the previous day with this pesticide is reported. The patients complained of headaches, dizziness, nausea and weakness, hand tremor and pain in the limbs, burning sensations in the tongue and eyes, and a feeling of permanent noise in the ears. All patients had symptoms of atopy. Two patients lost consciousness, and some had psychic disturbances such as depression and apathy. Two patients developed comatose symptoms lasting 8 to 12. hr. The first symptoms of peripheral nervous system disturbances (acetylcholine accumulation) developed 7 to 10 days following the incident and were focused mainly on the lower limbs. Atropine treatment constituted the basis of therapy. Prophylactic recommendations included a mandatory 3-day delay in resuming farm activities following chlorophos application.

72-0548. Nicaise, C. (Author Address not given). **Le depistage precoce des intoxications professionnelles par les pesticides organophosphores. [Early detection of occupational poisoning due to organophosphorus pesticides.]** *Arch. Belg. Med. Soc. 28: 349-364; 1970.* (15 references) (French)

Employees at a plant where organophosphorus pesticides (parathion and methyl parathion) were mixed and packed have been regularly checked for poisoning for 2 years. For such detection purposes, the simple and rapid method of blood cholinesterase activity measurement was used. These values ranged from 72 to 100% of the normal Thomas values, and urine PNP (*p*-nitrophenol) contents of 0.00-0.15 mg/l were detected. A definite relationship was found between cholinesterase activity values and the type of work performed. Poisonings due to organophosphorus pesticides have three stages: an enzymatic stage with cholinesterase activity partially inhibited; a subacute stage characterized by hypervagotonia, and an acute stage with minimum cholinesterase activity. In acute cases, suppression of any contact with pesticides, rest, and early and rapid atropinization and administration of contrathion are necessary. The evaluation of blood cholinesterase activity and urine *p*-nitrophenol analysis are described.

72-0549. Long, K. R. (Inst. of Agricultural Medicine, Dept. of Preventive Medicine and Environmental Health, Coll. of Medicine, U. of Iowa, Iowa City, IA). **Pesticides--an occupational hazard on farms.** *Amer. J. Nurs. 71(4): 740-743; 1971.* (13 references)

Inhalation and dermal exposure are almost inevitable when handling agricultural chemicals. In a survey of Iowa farmers, over half of a small group believed they were adversely affected by farm chemicals. Manifestations of illness include effects on the central nervous system resulting in impairment of mental alertness, increased tension, anxiety, and nervousness, which provoke sleep difficulties. One controlled study found chronic complaints of forgetfulness, difficulty in thinking, visual difficulties, and persistent muscular aches and pains along with fatigue and loss of interest in work by persons with a history of exposure to organophosphorus substances. In a 1967 report from California, more than 80% of reported occupational disease among farmers fell into one of the four categories of skin conditions, eye conditions, systemic poisonings, or chemical burns, in that order of magnitude. In Iowa, lower activity values of serum lactic dehydrogenase have been observed in a carefully controlled study of farmers who have a high use of pesticides. Indiscriminate use of pesticidial chemicals has been largely responsible for many of the problems that people do not attribute to pesticides. People should be made to realize that pesticides are poisons and should be used in response to a specific problem and not for convenience. Recent legislation in Florida and New York give evidence of things being done to control the use of pesticides.

72-0550. Wolff, F.; Jung, H.-D. (Bezirksinspektion Gesundheitsschutz, Neubrandenburg, Germany). **Akute kontaktdermatitiden nach Umgang mit Nematin (Vapam). [Acute contact dermatitis after contact with nematin].** *Z. Gesamte Hyg. 16: 423-426; 1970.* (11 references) (German)

Methyl mustard is the active ingredient of nematin (metham), and severe contact dermatitis was observed from this compound as early as 1968. Fifteen patients were under specialized dermatological treatment at that time; however, a causal correlation between the disease and occupation had been recognized. The causes of the disease are discussed. It is pointed out that a merely formal interpretation of the obligation to notifiy the competent authorities is apt to render the recording and detection of the morbidity rate caused by agrochemicals even more difficult.

72-0551. Cavagna, G.; Vigliani, E. C. (Clinica del Lavoro dell'Universita, Milan, Italy). **Problemes d'hygiene et de securite dans l'emploi du Vapona comme insecticide dans les locaux domestiques. [Hygienic and safety problems of the indoor use of the pesticide Vapona.]** *Med. Lav. 61(8-9): 409-423; 1970.* (62 references) (French)

The organophosphorus pesticide dichlorvos (DDVP, trademark Vapona) was investigated in animal tests, and its toxicity was found to be due mainly to cholinesterase inhibition. The effect of the indoor use of Vapona plaquettes on man can be determined from the degree of the inhibition of acetylcholine hydrolysis. *In vitro* experiments were carried out to investigate the various degrees of inhibition for pseudo-cholinesterase and acetylcholinesterase and to distinguish plasma pseudocholinesterase from erythrocyte cholinesterase. There was a 25% inhibition of the erythrocyte cholinesterase. Minimum toxicity and maximum tolerable inhibition values for man are based on erythrocyte acetylcholinesterase activity, rather than on plasma pseudocholinesterase activity. In tests carried out on men, absence and low degree of pseudo-cholinesterase inhibition was found with DDVP concentrations of 6 to 7 mg/m^3 (30-60 min) and 0.9-3.5 mg/m^3 (8 hr) in air. Another experiment was performed on hospital patients (children, pregnant women, etc.) more sensitive to DDVP. The indoor use of Vapona is harmless provided the instructions are observed, particularly in rooms used by patients and children.

72-0552. Pasi, A.; Leuzinger, S. (Hine Lab., Inc., San Francisco, CA). **Die Intoxikation durch Alkylphosphate. [Intoxication by alkyl phosphates.]** *Schweiz. Z. Militaermed. 47(3): 127-150; 1970.* (40 references) (German)

The properties of the alkyl phosphates are reviewed, with particular reference to symptoms and treatment in human intoxications. These widely used compounds are rapidly absorbed via skin, eyes, respiratory tract, and gastrointestinal tract. They inhibit cholinesterase, resulting in acetylcholine accumulation and, consequently, muscarine-like or nicotine-like symptoms. Survival is usually followed by complete recovery, except in some instances of hypoxic brain damage. Therapy consists of decontamination, atropinization, administration of oximes, and maintenance of respiration. Evaluation of the 536 cases of alkylphosphate poisoning reported to the Swiss Poison Information Center in Zurich revealed that cases of occupational poisoning were most frequent (184), followed closely by suicide attempts (170). There were 87 accidental ingestions and 35 instances of food contamination. Symptomology is related to ingestion route in a complex fashion.

72-0553. Zaslow, I. M.; Lenhard, A. A. (Brighton Animal Hosp., 723 Linden Ave., Rochester, NY 14625). **Successful treatment of thallium toxicosis in a dog (a case report).** *Vet. Med. Small Anim. Clin. 66(10): 974, 976; 1971.*

A case of thallium poisoning in a female cocker spaniel is reported. The successful therapeutic regimen is presented. Combiotic (a penicillin-dihydrostreptomycin combination) in a dosage of 250 mg was administered to control secondary bacterial infection. To counteract fatty infilitration of the liver and myocardium, she was given 5 cc of Cho-Meth (a quick source of B vitamins). One cc of Jenotone and 35 mg/lb diphenylthiocarbozone were administered to control increased motility of the intestinal tract and to increase elimination of thallium via the urine, respectively. The eyes were washed with boric acid and treated with Optisone. Subcutaneous doses of dextrose and electrolyte solution were given to replace respective losses.

72-0554. Rachmilewitz, M. (Hebrew U.-Hadassah Med. School, Jerusalem, Israel). **Disorders of the blood in changing environmental conditions.** *Haematol. Bluttransfus. 9: 138-148; 1970* (64 references)

Within the context of a review of blood disorders induced by chemical substances (mostly drugs) and nutritional deficiencies, the author mentions that reports describing the development of aplastic anemia due to DDT and lindane exposure are available from many parts of the world. Exposure is readily correlated with development of symptoms in the case of massive occupational contact; however, the correlation is less obvious in the case of chronic nutritional or habitational exposure. Few epidemiologic studies are available concerning the effect of insecticides on hemopoiesis; however, the storage levels of DDT in human tissue (e.g., 14 ppm in Israel) and preliminary findings concerning their metabolic effects would indicate a need for such studies. A table lists chlordane and parathion as other insecticides which may be associated with aplastic anemia.

72-0555. Jenny, E.; Wangenheim, M. (Institut fuer Pharmakologie und Biochemie, Veterinaermed. Fakultaet, U. of Zurich, Switzerland). **Ueber 426 akute Vergiftungsfaelle bei Tieren in der Schweiz. [A study of 426 cases of acute poisoning in animals in Switzerland.]** *Schweiz. Arch. Tierheilk. 112: 633-640; 1970.* (10 references) (German)

Preliminary efforts were made to gather morbidity and mortality statistics on incidents of poisoning in domestic animals in order to provide the necessary background data for preventive measures and regulations. Data were obtained on the first 426 cases of poisoning in animals reported to the Swiss Poison Information Center in Zurich for which the causes were known. These data were classified in various ways and compared with information obtained from one other poison information center and from the literature. A small percentage was due to natural causes: 4.7% to poisonous plants; 0.9% to poisonous animals; and 1.1% to food and luxury items. In the case of the man-made substances, 11.7% were attributable to chemical raw materials, 63.6% to preparations available to the public (55% of these were due to pesticides), and 18.0% to drugs. Dogs were more likely to be poisoned with drugs and rodenticides, and cattle with chemicals and herbicides or insecticides. These statistics are admittedly biased by the initial selection (cases reported as significant by veterinarians), the center's location (predominantly urban and suburban clientele), and the small number of cases. International cooperation in the assembling of proper statistics is required.

72-0556. Dvorak, P. (Institut fuer Strahlenbiologie, Kernforschungszentrum, 75 Karlsruhe 1, Germany). **Hexacyanoferrate (II) als Thallium-Antidote. [Hexacyanoferrates (II) as thallium antidotes.]** *Arzneim.-Forsch. 20(12): 1886-1888; 1970.* (9 references) (German)

Previous studies revealed that Fe^{3+}, Co^{2+}, and Ni^{2+} hexacyanoferrates (II) reduce the absorption of thallium from the intestinal tract, thus greatly reducing its biological half-life and toxicity, especially when they are administered in the colloidal state. The present report deals with extensive studies on the preparation of stable hexacyanoferrates and determinations of their composition, thallium-binding capacity, stability, and solubility. Solubilities in the range of 1 to 3μM/1 were found. Disintegration to cyanide within a 1-year period was negligible. A daily dosage of 3 g of colloidal hexacyanoferrate was calculated to be effective in human thallium poisoning.

72-0557. Radomski, J. L.; Astolfi, E.; Deichmann, W. B.; Rey, A. A. (Dept. of Pharmacology and the Research and Teaching Center of Toxicology, U. of Miami School of Medicine, Miami, FL.). **Blood levels of organochlorine pesticides in Argentina: Occupationally and nonoccupationally exposed adults, children, and newborn infants.** *Toxicol. Appl. Pharm. 20(2): 186-193; 1971.* (6 references)

Determination of the concentration of organochlorine pesticides has been made in adults, children, newborn infants, and various groups of occupationally exposed individuals in Argentina. β-BHC levels in adults in Argentina are approximately 16 times higher, on the average, than the levels of β-BHC found in the U.S. In contrast, the concentrations of p,p'-DDE, dieldrin, and p,p'-DDT are closely similar to those in the U.S. Concentrations of β-BHC in children in Argentina are lower, but still higher than in adults in the U.S., and much higher than in U.S. children. Pesticide levels in workers handling β-BHC were extremely high, as were the levels of DDT and isomers in those occupationally exposed to this pesticide. No dieldrin was detected in these workers—a possible indication that microsomal stimulation by DDT may have been responsible for clearing the tissues. The DDE : DDT ratio appeared to be an accurate measurement of a recent exposure to DDT. Pesticides passed the placental barrier, but transmission was apparently somewhat retarded. Concentrations of p,p'-DDE, p,p'-DDT, dieldrin, and β-BHC in the newborn were approximately 40% of the pesticide concentrations in the blood of the mother. This percentage was higher for β-BHC and lindane. (Author abstract by permission).

See also 72-0426 72-0427 72-0429 72-0432 72-0435 72-0436 72-0440 72-0441 72-0443 72-0444 72-0445 72-0448 72-0449 72-0452 72-0467 72-0472 72-0498 72-0499 72-0567 72-0568 72-0571 72-0599 72-0602 72-0610 72-0611 72-0620 72-0621 72-0645 72-0651 72-0654

72-0558. Ivanova-Chemishanska, L.; Markov, D. V.; Dashev, G. (Research Inst. of Labour Protection, and Occupational Diseases, Regeneration Research Lab., Bulgarian Acad. of Sciences, and Dept. of Endocrinology, Postgraduate Medical School, Sofia, Bulgaria). **Light and electron microscopic observations on rat thyroid after administration of some dithiocarbamates.** *Environ. Res. 4(3): 201-212; 1971.* (29 references)

Morphological methods (histology, histochemistry, and electron microscopy) were utilized to study the effect of 30 days' application of 0.1 LD50 of some dithiocarbamates (maneb, zineb, mancozeb) on the rat thyroid gland. Increased thyroid function was indicated by the available data. Since maneb, zineb, and mancozeb inhibit the iodine concentration of the thyroid it is postulated that the changes were the result of increased thyrotropin stimulation.

72-0559. Douch, P. G. C.; Smith, J. N. (Dept. of Biochemistry, Victoria U. of Wellington, P. O. Box 196, Wellington, New Zealand). **Metabolism of *m-tert.*-butylphenyl *N*-methylcarbamate in insects and mice.** *Biochem. J. 125(2): 385-393; 1971.* (26 references)

The metabolism of *m-tert.*-butylphenyl *N*-methylcarbamate was studied in mice and five species of insects. Both the *tert.*-butyl group and the *N*-methyl group were hydroxylated. The major phenolic metabolite was *m*(β-hydroxy-*tert.*-butyl)phenol, which was identified by mass spectroscopy. Significant amounts of dihydroxy compounds were formed at a constant rate from the start of the enzymic oxidation process. The considerable species variation in the yields of the different types of oxidation products suggests that *N*-demethylation and oxidation of the *tert.*-butyl groups were catalyzed by different enzymes. A microsomal NADPH-dependent enzyme also catalyzed the splitting of the ester link in the insecticide. (Author abstract by permission)

72-0560. Douch, P. G. C.; Smith, J. N. (Dept of Biochemistry, Victoria U. of Wellington, P. O. Box 196, Wellington, New Zealand). **The metabolism of 3,5-di-*tert.*-butylphenyl *N*-methylcarbamate in insects and by mouse liver enzymes.** *Biochem. J. 125(2): 395-400; 1971.* (12 references)

The oxidation of 3,5-di-*tert.*-butyphenyl *N*-methylcarbamate (Butacarb) has been studied in the flies *Musca domestica* and *Lucilia sericata*, grass grubs *Costelytra zealandica* and the mouse. In all species eleven oxidation products which were formed by hydroxylation of the *tert.*-butyl groups and the *N*-methyl group, were detected. (Author abstract by permission)

72-0561. Pocker, Y.; Beug, W. M.; Ainardi, V. R. (Dept. of Chemistry, U. of Washington, Seattle, WA 98105). **Carbonic anhydrase interaction with DDT, DDE, and dieldrin.** *Science 174(4016): 1336-1339; 1971.* (18 references)

The active site of various carbonic anhydrases is not blocked by DDT, DDE, or dieldrin. Impairment of catalytic efficiency can only be documented in opalescent test solutions in which the insecticides are present in excess of their solubility limit. These slowly forming precipitates occlude enzyme from solution and furnish a physical explanation of the supposed inhibition. The amounts occluded depend, among other things, on the conformational and topographical characteristics of the particular carbonic anhydrase molecules. (Author abstract by permission, copyright 1971 by the American Association for the Advancement of Science)

72-0562. Davis, P. W.; Wedemeyer, G. A. (Dept. of Pharmacology, U. of Washington School of Medicine and Western Fish Disease Lab., Dept. of Interior, Seattle, WA). **Na^+, K^+-activated-ATPase inhibition in rainbow trout: a site for organochlorine pesticide toxicity?** *Comp. Biochem. Physiol. 40(5B): 823-827; 1971.* (17 references)

Chlorinated hydrocarbon pesticides were used to inhibit, *in vitro*, the Na^+, K^+-activated, Mg^{2+}-dependent-ATPase enzyme system in a heavy microsomal fraction of rainbow trout (*Salmo gairdneri*) brain. The pesticides caused inhibition in the kidney and gill ATPase preparations; the I50 values for DDT, endosulfan and dicofol were 1×10^{-4}, 3×10^{-5}, and 5×10^{-6} M respectively. Ouabain, the classic inhibitor, failed to block the Na^+, K^+-activated element of ATPase activity in the gill. It is proposed that the toxic effects of organochlorine pesticides cause inhibition of ATPase activity in fishes.

72-0563. Pokorny, J. (IHE, Inst. for Public and Communal Hygiene, Prague, Czechoslovakia). **Prispevek ke stanoveni inhibicnich koncentraci nekterych pesticidnich pripravku. [The estimation of inhibiting concentrations of several pesticides.]** *Cesk. Hyg. 16(4/5): 141-145; 1971.* (8 references) (Czech)

Concentrations for 11 commercial pesticides: Nitrosan (DNOC), Intration (thiometon), Soldep (trichlorfon), Fosfotion (malathion), Dykol (DDT), Kuprikol (copper oxychloride), Novozir (zineb), Dititex (MCPA), Zeazin (atrazine), paraquat, and diquat, commonly present in the water and soil microflora and inhibiting the growth of several microorganisms (*E. coli, Pseudomonas aeruginosa, Proteus vulgaris, Bacterium prodigiosum*), were estimated. Of the majority of preparations tested the inhibiting concentrations varied between 1000-10,000 mg/l. The two most effective pesticides were paraquat (500 mg/l) and diquat (50 mg/l). No changes in the fundamental biochemical properties were observed when concentrations relatively not much below the inhibitory level were used.

72-0564. Snow, D. H. (Dept. of Veterinary Pathology, U. of Sydney, Sydney, Australia). **The effects of dichlorvos on several blood enzyme levels in the greyhound.**

Aust. Vet. J. 47(10): 468-471; 1971. (16 references)

The organophosphorus anthelmintic dichlorvos was administered to ten healthy greyhounds and its effect on red blood cell acetylcholinesterase, plasma cholinesterase, SGOT (glutamic oxaloacetic transaminase), SGPT (glutamic pyruvic transaminase), SAP (serum alkaline phosphatase) and β-glucuronidase was studied. At this time, greater and more prolonged inhibition of red blood cell acetylcholinesterase and plasma cholinesterase was produced by the recommended therapeutic dose than prior to testing. In nine out of ten dogs the administration of dichlorvos did not influence SGOT, SGPT, and SAP activities; however, the serum level of these enzymes rose in one dog which is connotative of liver damage. The serum level of β-glucuronidase was not altered on administration of dichlorvos and none of the animals showed clinical signs of poisoning.

72-0565. Rosival, L.; Kapeller, K. (Research Inst. of Hygiene, Bratislava, Czechoslovakia). **Heptachlor-induced morphological changes.** *Proc. Fourth Int. Congr. Rural Med.–Whither Rural Medicine? Edited by H. Kuroiwa et al. Jap. Ass. of Rural Med., Tokyo, Japan, 29-32; 1970.* (2 references)

Heptachlor was administered to rats in doses of 2 mg/kg for seven days and 6 mg/kg for 28 days. Liver samples taken at 7, 14, and 28 days revealed slight changes in the endoplasmic reticulum (irregularly shaped vacuoles) but the applied doses did not cause rat liver lesions which could have been proven by examination of the enzyme activities of glutamate-oxalacetate and glutamate-pyruvate transaminase, lactate dehydrogenase and alkaline phosphatase in the serum. The ultrastructural changes–as viewed by electronic microscopy–could have been caused by other factors (concurrent infection and anorexia).

72-0566. Hashimoto, Y.; Makita, T.; Mori, T.; Nishibe, T.; Noguchi, T.; Watanabe, S. (Chemical Toxicology and Applied Pharmacology Lab., Biological Research Inst., Nippon Soda Co., Ltd., Kanagawa Pref., Japan). **Preclinical experiments on the antidote against monofluoroacetic acid derivatives poisoning in mammals.** *Proc. Fourth Int. Congr. Rural Med.–Whither Rural Medicine? Edited by H. Kuroiwa et al. Jap. Ass. of Rural Med., Tokyo, Japan, 59-62; 1970.* (11 references)

Acetamide and glucose are used as antidotes against *N*-methyl-*N*-(1-naphthyl) monofluoroacetamide (MNFA). Intravenous and intraperitoneal injection of 500 mg/kg t.i.d. of acetamide against LD99, MNFA showed a complete cure but the oral dose had no effect at all; 1000 mg/kg t.i.d. of acetamide was needed against LD50, FAA. Comparative effects of acetamide and glucose are considered. The most excellent antidote was found to be acetamide in 50% glucose solution administered intravenously in all species. A typical diagnosis of fluoroacetate poisoning is presented.

72-0567. Tomatis, L. (International Agency for Research on Cancer, Lyons, France). **Studies on the potential carcinogenic hazard represented by DDT.** *Proc. Fourth Int. Congr. of Rural Med.–Whither Rural Medicine? Edited by H. Kuroiwa et al. Jap. Ass. of Rural Med., Tokyo, Japan, 64-71; 1970.* (22 references)

DDT is classified with the group of pesticides which are less acutely toxic but persist in food and the environment. Although the frequency of acute and subacute intoxication by DDT is small, it does not rule out the possibility of long term adverse effects. DDT and its metabolites have been found mostly in foods and in small amounts in cosmetics. Studies have been conducted with mice to establish the effects of DDT in the diet. The administration of 2.8-3.0 ppm of DDT to BALB/c mice resulted in the occurrence of tumors in the second generation and more prominently in the following generations. No definite conclusion to the prolonged effect of DDT can be reached as yet, but it does represent a calculated risk and it stands the carcinogenic risk.

72-0568. Rudi, G. G. (Kishinev, USSR). **Question of amino acid metabolism in poisoning by toxic substances containing small quantity of copper.** *Proc. Fourth Int. Congr. Rural Med.–Whither Rural Medicine? Edited by H. Kuroiwa et al. Jap. Ass. of Rural Med., Tokyo, Japan, 75-77; 1970.*

Pesticides containing copper are used in the vineyards in the USSR and a study was conducted to ascertain the effect of copper uptake on the organism. The copper preparation (copper sulfate, bordeaux mixture of copper chloride *etc.*) was introduced into white rats in small doses (1.7 and 0.5 mg/kg/w) for 70 days. At the end of that time the rats were killed and free amino acid content was investigated. It was noted that due to the copper uptake there was a change in the volume of free amino acid in urine, blood plasma and other organs. When there is a pathological change in the kidney the amino acid content changes as it did in the rats. When there is an excess of copper in the organism there is an excess of amino acid excretion in the urine. At this time it is important to be aware of nonspecific and latent changes which can lead to pathological disturbances. Technical progress has contributed to the lessening of this hazard.

72-0569. Ichikawa, H. (Saku Central Hospital, Nagano Pref., Japan). **Studies on chronic toxicity of phenylmercuric acetate.** *Proc. Fourth Int. Congr. Rural Med.–Whither Rural Medicine? Edited by H. Kuroiwa et al. Jap. Ass. of Rural Med., Tokyo, Japan, 77-80; 1970.*

A study on the chronic toxicity of phenylmercuric acetate was instituted and is still going on. Phenylmercuric acetate was administered to rabbits and monkeys at set doses of 1.25, 0.25, 0.05 and 0.01 mg/kg/day. After three months the urine protein became

positive. The mercury content was found to be the greatest in the kidney; however, no marked changes were observed. It was found that the changes in the monkeys were not uniform, leading one to suspect allergic reaction and not actual poisoning which was not the case with the domestic rabbits.

72-0570. Kasamatsu, S.; Takayama, S. (Faculty of Medicine, Asuncion National U., Asuncion, Paraguay). **Electron microscopic observations of renal lesions caused by phenylmercuric acetate.** *Proc. Fourth Int. Cong. Rural Med.–Whither Rural Medicine? Edited by H. Kuroiwa et al. Jap. Ass. of Rural Med., Tokyo, Japan, 80-81; 1970.*

The changes in the kidney of domestic rabbits and *Macacas rhesus* were observed electron microscopically after administration of phenylmercuric acetate (PMA). Pathological changes in the proximal convoluted tubules were observed in the group of rabbits which were dosed with 250 ppm of PMA. In the *Macacas rhesus* PMA was administered for 2 yr and no injury in the proximal convoluted tubules was noted.

72-0571. van Genderen, H. (Instituut voor Veterinaire Farmacologie en Toxicologie der Rijksuniversitet, Utrecht, The Netherlands). **Biologische effecten van persistente organisch-chemische produkten (chloorkoolwaterstoffen). [Biological effects of persistent organic chemicals (chlorinated hydrocarbons).]** *Tijdschr. Soc. Geneesk, 49(22): 792-796; 1971.* (19 references) (Dutch)

The effects of long-term exposure to low levels of chlorinated hydrocarbons in birds and laboratory animals are reviewed, with particular reference to their implications for man. In contrast to the results of acute overexposure, these effects are difficult to recognize and combat in time. The induction of microsomal liver enzymes by the chlorinated hydrocarbons has sometimes been viewed as an advantageous adaptive process. However, this interpretation is opposed by the observations of hepatogenic porphyria and increased degradation of endogenous steroids in the liver noted after such induction, particularly involving the mixed function oxidase system. More detailed studies on the porphyrogenic properties of the polychlorinated biphenyls revealed the presence of traces of polychlorobenzofurans in the commercial preparations. The latter are undergoing continued investigation in connection with their extreme persistence and suspected heptatoxicity.

72-0572. Tierney, D. F. (Dept. of Medicine, Harbor General Hospital and UCLA School of Medicine, Los Angeles, CA). **Lactate metabolism in rat lung tissue.** *Arch. Intern. Med. 127: 858-860; 1971.* (11 references)

Slices of lung were taken from anesthetized rats and lactate production was determined. Lactate was produced until the concentration in the medium greatly exceeded the blood concentration. In contrast, cells washed from the lung, slices of liver and kidney will consume lactate until the concentration in the medium is less than the blood concentration. In lung tissue the lactate-pyruvate ratio was higher than in other tissues. Pentobarbital sodium and halothane increased lactate production from lung tissue; however, paraquat, acetate, and palmitate had no significant effect.

72-0573. Anonymous. **Pesticides as mutagens.** *The Lancet 1073-1074; 1971.* (1 reference)

It has been found that allyl isothiocyanate, a substance found in horseradish sauce, has been known to be mutagenic. It is suggested that all pesticides and herbicides be tested for a possible mutagenic hazard. This should be done in mammalian systems at doses corresponding to likely human exposure.

72-0574. Mahmoud, S. A. Z.; Selim, K. G.; El-Mokadem, M. T. (Dept. of Agricultural Botany, Faculty of Agriculture, Ain Shams U., Cairo, Egypt). **Effect of dieldrin and lindane on soil microorganisms.** *Zentralbl. Bakteriol. 125: 134-149; 1970.* (31 references)

Dieldrin and lindane were added at 25 mg/kg or 2/2 mg/kg to clay soil, supplemented with 2% compost and maintained at 50% humidity for 40 days. Microbiological assays and chemical analyses were performed on samples taken at 0, 2, 4, 8, 15, 25 and 40 days. Dieldrin first enhanced, then inhibited the total microbial flora, whereas lindane stimulated it, more markedly at the lower concentration. Dieldrin did not affect the growth of the spore formers, but lindane had a slight stimulatory effect. The actinomycetes were depressed by dieldrin but stimulated by lindane. The aerobic nonsymbiotic nitrogen-fixing bacteria, *Azotobacter*, were stimulated by both the insecticides applied. Dieldrin effected a marked stimulation of the nitrogen-fixing clostridia, and lindane a reduction. Both lindane and dieldrin depressed the nitrifying bacteria, lindane to a greater degree. Lindane exerted a continuous stimulatory effect on the aerobic cellulose decomposers, while dieldrin reduced their number during the first two weeks only. The chemical analyses revealed no change in the rate of organic matter decomposition upon the addition of either insecticide. With dieldrin, the total nitrogen was slightly increased, but not with lindane. Both insecticides reduced the rate of ammonification and nitrification, the latter to a greater degree. The results are compared with literature values.

72-0575. Price, M. A.; Radeleff, R. D.; Kunz, S. E.; Everett, R. E. (Dept. of Entomology, Texas Agricultural and Mechanical U., College Station, TX). **Toxicity of soil applications of Dursban to bobwhite quail.** *Texas Agricultural Experiment Station Progress Report No. PR-3000, July 1971, 3p.* (4 references)

Dursban is applied to the soil for turkey chigger control on turkey ranges; it causes no tissue residue problem in marketed turkeys. Actue toxicity studies

were performed to determine the potential effect of Dursban on bobwhite quail which may enter upon treated turkey ranges. No mortality due to Dursban was noted in bobwhite quail held for 1 wk in pens treated at 4 lb/acre, and they did not avoid the treated areas.

72-0576. McBride, B. C.; Wolfe, R. S. (Dept. of Microbiology, U. of Illinois, Urbana, IL 61801). **Inhibition of methanogenesis by DDT.** *Nature 234(5531): 551-552; 1971.* (10 references)

DDT at 10^{-6}M inhibits the reduction of carbon dioxide in cell-free extracts of *Methanobacterium* strain M.o.H. by 75%, and is thus a potent inhibitor of methane formation. Whole cells require twelve times as much DDT to inhibit methane formation to the same extent. DDD inhibits methane synthesis in cell extracts, but less effectively than DDT, whereas methoxychlor is almost as effective as DDT. The three cyclodienes examined as well as DME and DDE had no effect on cell extracts or whole cells. This suggests that the inhibitory site is centered in the trichloroethane portion of the molecule. The correspondence of inhibition of methane synthesis in *Methanobacterium* with insecticidal activity in DDT analogs suggests that this system may be a good tool for studying the mechanism of DDT inhibition.

72-0577. Kapoor, I. P.; Metcalf, R. L.; Hirwe, A. S.; Lu, P.-Y.; Coats, J. R.; Nystrom, R. F. (Depts. of Entomology and Zoology, U. of Illinois, Urbana, IL 61801). **Comparative metabolism of DDT, methylchlor, and ethoxychlor in mouse, insects, and in a model econosytem.** *J. Agr. Food Chem. 20(1): 1-6; 1972.* (14 references)

Ethoxychlor [2,2-bis(*p*-ethoxyphenyl)-1,1,1-trichloroethane] and methychlor [2,2-bis(*p*-methylphenyl)-1,1,1-trichloroethane] were evaluated for metabolic pathways in mice and insects for biodegradability in a model econosystem. Ethoxychlor, like methoxychlor, was metabolized by O dealkylation to form 2-(*p*-hydroxyphenyl)-2-(*p*-ethoxyphenyl)-1,1,1-trichloroethane and subsequently to 2,2-bis(*p*-hydroxyphenyl)-1,1,1-trichloroethane. In the model econosystem ethoxychlor was found in fish at the top of the food chain at 1500 times the amount in water, together with large amounts of polar and dealkylation products. Methylchlor was metabolized by oxidation of the arylmethyl groups to form 2-(*p*-hydroxymethylphenyl)-2-(*p*-methylphenyl)-1,1,1-trichloroethane and by subsequent oxidation to 2,2-bis(*p*-carboxyphenyl)-1,1,1,-trichloroethane. In the model econosystem, methylchlor was found in fish at 1400 times the amount in water together with larger amounts of polar metabolites. These two DDT analogs are much more biodegradable than DDT, which was concentrated in fish at 85,000 times the amount in water. (Author abstract reprinted by permission of the American Chemical Society)

72-0578. Sink, J. D.; Varela-Alvarez, H.; Hess, C. (Dept. of Animal Science, The Pennsylvania State U., University Park, PA 16802). **Metabolism of ^{14}C-DDT by ovine rumen fluid** *in vitro. J. Agr. Food Chem. 20(1): 7-9; 1972.* (13 references)

An *in vitro* study of ^{14}C-DDT metabolism by ovine (*Ovis aries*) rumen fluid was conducted to determine the effect of nutritional regimen, concentrate, and roughage. Rumen samples were obtained using a stomach tube. Half of the samples were boiled and half were not. All were incubated at 39°C with ^{14}C-DDT for 0, 4, 8, and 12 hr. Following incubation the samples were extracted, concentrated, thin-layer chromatographed, assayed by scintillation counting. Concentrate diets were more efficient ($P<0.01$) in affecting the degradation of ^{14}C-DDT than were the roughage diets. The rate of degradation was noted to increase ($P<0.01$) with incubation time. ^{14}C-DDD and ^{14}C-DDE were identified as ^{14}C-DDT metabolites. Another metabolite with ^{14}C activity was observed and tentatively identified as DDMU, 1-chloro-2,2-bis(*p*-chlorophenyl)ethylene. The pathway of DDT metabolism to DDMU was essentially *via* DDD ($P<0.01$) rather than DDE. (Author abstract reprinted by permission of the American Chemical Society)

72-0579. Wells, M. R.; Yarbrough, J. D. (Dept. of Biology, Middle Tennessee State U., Murfreesboro, TN 37130). **Vertebrate insecticide resistance: *in vivo* and *in vitro* endrin binding to cellular fractions from brain and liver tissues of *Gambusia*.** *J. Agr. Food Chem. 20(1): 14-16; 1972.* (11 references)

The *in vivo* and *in vitro* binding patterns of endrin-^{14}C in susceptible and resistant mosquitofish brain and liver cellular fractions were compared. The cell membrane fractions of resistant fish bind more endrin than susceptible fish, while the resistant mitochondria bind less endrin than susceptible fish mitochondria. Differences between endrin uptake in susceptible and resistant fish, retention of endrin by brain cell membranes, a blood-brain barrier, and a structural difference in myelin could account for endrin resistance in mosquitofish. (Author abstract reprinted by permission of the American Chemical Society)

72-0580. Miyata, T.; Matsumura, F. (Dept. of Entomology, U. of Wisconsin, Madison, WI 53706). **Organophosphate degrading enzymes in the crude supernatant fraction from the rat liver.** *J. Agr. Food Chem. 20(1): 30-32; 1972.* (16 references)

Attempts were made to classify the enzymes which degrade insecticidal organophosphates in the crude supernatant fraction (*i.e.* 20,000 × *g* supernatant) of the rat liver. On the basis of cofactor and ion activation characteristics of the enzymes, four distinctly different types of enzymes have been observed. The enzymes which degraded malathion and parathion were de-

tected by the electrophoresis method. Electrophoresis treatments did not, however, facilitate the detection of Ca^{2+} or GSH-simulated enzymes. Most of the esterases detected in the rat liver 20,000 X g supernatant by using 1-naphthyl acetate do not appear to play any significant role in degrading organophosphates. (Author abstract reprinted by permission of the American Chemical Society)

72-0581. Paulson, G. D.; Zehr. M. V.; Dockter, M. M.; Zaylskie, R. G. (United States Department of Agriculture, Animal Science Research Division, ARS, Metabolism and Radiation Research Lab., Fargo, ND 58102). **Metabolism of *p*-chlorophenyl *N*-methylcarbamate in the rat and goat.** *J. Agr. Food Chem. 20(1): 33-37; 1972.* (15 references)

Rats and milking goats were given a single dose of either *p*-chlorophenyl-^{14}C (U) *N*-methylcarbamate (ring-label) or *p*-chlorophenyl *N*-methylcarbamate-^{14}C (carbonyl label). Expiratory gases contained carbon-14 after the carbonyl labeled compound was given but not after the ring-labeled compound was given. Most of the carbon-14 administered as the ring-labeled compound was excreted in the urine, with only trace amounts in the feces. Milk from the goat, as well as tissues from the rat and goat, contained trace levels of carbon-14 48 hr after dosing with the ring-labeled compound. Goat urine contained *p*-chlorophenol (A), *p*-chlorophenyl glucuronide (B), *p*-chlorophenyl sulfate (C), 4-chlorocatechyl 1-sulfate (D), and three minor unidentified ^{14}C-labeled metabolites. Goat milk collected 6 hr after dosing contained C and D. Metabolites, A, B, and C were present in rat urine. (Author abstract reprinted by permission of the American Chemical Society)

72-0582. Grunow, W.; Boehme, C.; Budczies, B. (Bundesgesundheitsamt, Max von Pettenkofer-Institut, Laboratorium fuer Ernaehrungshygiene, 1 Berlin 33, Germany). **Renale Ausscheidung von 2,4,5-T bei Ratten. [Renal excretion of 2,4,5-T in the rat.]** *Food Cosmet. Toxicol. 9(5): 667-670; 1971.* (10 references) (German)

Rats were dosed with 50 mg/kg body weight of 99.6% pure 2,4,5-T suspended in peanut oil; the urine excreted was collected for 7 days thereafter. Following methylation of the prepared extract for the determination of the free compound, or hydrolysis plus methylation to determine total 2,4,5-T, quantitative gas chromatography was performed. In addition, *N*-(2,4,5-trichlorophenoxyacetyl)glycine was isolated from the urine of five additional rats and identified by IR spectrometry. Only 45-70% of free plus bound 2,4,5-T was detected in the urine in this manner; a distinct excretion peak occurred on the second day after dosing, decreasing gradually from the first to fourth day, then continuing at lower levels through the seventh day. The derivatives accounted for 10-20% of the dose administered.

72-0583. Hutson, D. H.; Moss, J. A.; Pickering, B. A. (Shell Research Ltd., Broad Oak Road, Sittingbourne, Kent, England). **The excretion and retention of components of the soil fumigant D-D and their metabolites in the rat.** *Food Cosmet. Toxicol. 9(5): 677-680; 1971.* (7 references)

The metabolic fate in rats was studied of the 3 major components of a soil fumigant used in the control of various nematodes which are pests for a variety of crops. The fumigant, known as D-D, is essentially a mixture of chlorinated compounds, the major components of which are 1,2-dichloropropane, (30% w/w), *cis*-1,3-dichloropropane (27.7%) and *trans*-1,3-dichloropropane (27.4%). The three main components were synthesized with a ^{14}C-label and the rates and routes of excretion and the retention of radioactivity were measured after separate oral administration of the three compounds. Recoveries of radioactivity from rats in the four days following oral administration of each compound are shown for urine, feces, gut, skin, carcass, and exhaled air. The urine was the major route of excretion in all 3 cases. It was concluded that, unlike other pesticidal chlorinated hydrocarbons, such as DDT, there appears to be no residue problem when these compounds are ingested by rats.

72-0584. Fowler, J. S. L (Biochemistry Dept., ICI, Pharmaceuticals Div., Alderley Park, Macclesfield, Cheshire, England). **Toxicity of carbon tetrachloride and other fasciocidal drugs in sheep and chickens.** *Brit. Vet. J. 127(7): 304-312; 1971.* (24 references)

The 48-hr LD50 value of carbon tetrachloride administered to chickens by stomach tube was found to be 2.83 ml/kg for chickens pretreated for 4 wk with saline solution (controls), and 4.00 for those pretreated by subcutaneous injection of phenobarbitone, polyethylene glycol, or DDT, thus no significant difference. This constrasts with results previously obtained in rats, where prior DDT administration increased the toxicity of carbon tetrachloride ten-fold, presumably due to stimulation of liver microsomal activity and conversion to toxic metabolites.

72-0585. Patocka, J.; Bajgar, J. (Purkyne Medical Research Inst., Hradec Kralove, Czechoslovakia). **Affinity of human brain cholinesterase to some organophosphates and carbamates *in vitro*.** *J. Neurochem. 18(12): 2545-2546; 1971.* (15 references)

The authors determined affinity constants (equal to I50 for irreversible inhibitors) and Hill coefficients *in vitro* for human brain acetylcholinesterase in 9 insecticides: DFP, TEPP, EDMM (*O*-ethyl-*S*-(2-dimethylaminoethyl)methylthiophosphonate), EDEM (*O*-ethyl-*S*-(2-diethylaminoethyl) methylthiophosphonate), PMPF (*O*-pinacolylmethyl phosphonofluoridate), malathion, eserine, Sevin (carbaryl) and NDMC (1-naphthyldimethylcarbamate). The

results obtained are in good agreement with literature values, where available; highest PI50 values were found for EDEM and PMFP, lowest for malathion, Sevin and NDMC. Typical allosteric inhibition was observed in the Hill plots for EDEM, TEPP, Sevin and NDMC.

72-0586. Iwasaki, I.; Nawa, H.; Hara, A.; Takagi, S.; Hyodo, K. (Okayama, Japan). **Agricultural organofluoride poisoning: II. Cardiac damage.** *Fluoride 3(3): 127-130; 1970.*

Rabbits have been experimentally intoxicated with *N*-methyl-*N*-(1-naphthyl)-monofluoroacetamide (MNFA, Nissol). As a result they showed characteristic electrocardiographic ST, T changes and also alterations of lactic dehydrogenase, transaminases and serum electrolytes.

72-0587. Iwasaki, I.; Namba, M.; Nawa, H.; Hara, H.; Takagi, S.; Hyodo, K. (Okayama, Japan). **Studies on organofluoride poisoning III. Experimental acute and chronic poisoning.** *Fluoride 3(3): 131-133; 1970.* (4 references)

The skins of rabbits were painted with 2 ml of 25% emulsified solution of *N*-methyl-*N*-(1-naphthyl) monofluoroacetamide to induce acute and chronic intoxication. Both in acute and chronic intoxication marked myocardial degeneration was observed. It was also manifested by electroencephalographic abnormalities that organofluoride poisoning caused ischemic changes and nerve cell alterations in the central nervous system.

72-0588. Egyed, M. N.; Shupe, J. L. (Kimron Veterinary Inst., Bet Dagan, Israel). **Experimental acute fluoroacetamide poisoning in sheep and dogs.** *Fluoride 4(3): 129-136; 1971.* (18 references)

Acute, fatal experimental fluoroacetamide (FAA) poisoning in sheep is described. The results are based on clinical observations and the presence of lesions. Ventricular fibrillation was demonstrated in one of the sheep. Poisonous skeletal muscle of sheep was fed to two dogs which produced secondary FAA poisoning. The symptoms of both sheep and dog were almost identical to symptoms of sodium fluoroacetate poisoning. In the dog the pathological findings were more noticeable than in the sheep. The lesions were acute, non-specific, and non-pathognomic.

72-0589. Egyed, M. N.; Miller, G. W. (Kimron Veterinary Inst., Bet Dagan, Israel). **Experimental acute fluoroacetamide poisoning in guinea pig and sheep.** *Fluoride 4(3): 137-142; 1971.* (14 references)

Blood sugar, tissue and blood citric acid, and tissue oxygen uptake were studied in experimentally produced fluoroacetamide poisoning. The oxygen consumption in the poisoned guinea pig and sheep tissues was decreased. The degree of inhibition was more striking when FAA was added to normal guinea pig tissue slices and especially to guinea pig kidney mitochondria. In the poisoned guinea pig and sheep the blood and citric acid were elevated. FAA-poisoned sheep demonstrated a significant increase in their blood sugar.

72-0590. Bajgar, J.; Tulach, J.; Jakl, A.; Patocka, J. (Purkyne Medical Research Inst., Hradec, Kralove, Czechoslovakia). **Differences in anticholinesterase action of some organophosphorus compounds** *in vivo. Acta Biol. Med. Germ. 27(1): 171-178; 1971.* (7 references)

A toxidynamic analysis of the mode of poisoning of *O*-pinacolylmethyl phosphorofluoridate and *O*-ethyl-*S*-(2-dimethylaminoethyl)methylthiophosphonate was formulated which may be used not only for organophosphates but also, with modifications, for the action of other drugs. Using male Wistar rats, acetylcholinesterase activity in the brain, heart, lungs, and diaphragm was studied as a function of dosage, time, and symptoms of poisoning. Constants characterizing the time dynamics of intoxication were used to correlate clinical findings, and acetylcholinesterase activity. It was suggested that previous discussion concerning poor correlation between the clinical picture of poisoning and acetylcholinesterase activity was probably due to the differences of acetylcholinesterase inhibition in various organs, as shown by the rate of penetration, the affinity of organophosphate to acetylcholinesterase and other enzymes, the rate of detoxication, and so forth. It was also suggested that a more detailed study of organophosphates would require increasing the number of organs examined and to study the changes in acetylcholinesterase activity in different parts of the central nervous system.

72-0591. Anderson, J. P. E.; Lichtenstein, E. P. (Dept. of Entomology, U. of Wisconsin, Madison, WI). **Effect of nutritional factors on DDT-degradation by** *Mucor alternans. Can. J. Microbiol. 17(10): 1291-1298; 1971.* (18 references)

The effects of various nutritional factors on the capacity of *M. alternans* to degrade DDT in shake cultures was investigated with the object of studying the relationship between vegetative growth and DDT degradation. Effects of carbon-nitrogen ratio, different carbon sources, different nitrogen sources, and DDT concentration on the production of water-soluble DDT metabolites were also studied. Ring-labeled p,p'-^{14}C-DDT was used in the experiments while dicofol (DDA) (bis-(*p*-chlorophenyl)acetic acid) and DBP (4,4-dichlorobenzophenone) were used as reference materials. Fungal spores did not grow in media that contained DDT as the sole carbon source, but remained viable over a 2-month period and developed into a mycelium after addition of glucose. The degradation of DDT by the fungus was not related to the mycelial mass. The quantity of water-soluble metabolites produced from DDT

was dependent on the insecticide concentration, but largely on the carbon and nitrogen sources in the culture media. Largest quantities of the metabolites were found formed with glucose and ammonium nitrate. The concentration of a glucose affected this metabolism quantitatively. When ammonium nitrate was replaced with other nitrogen sources, the production of water-soluble metabolites was substantially reduced and qualitative differences in the appearance of metabolites were also observed. A previous suggestion that quantities of the insecticide are stored in mycelial fats appeared tenable since the undegraded DDT recovered from *M. alternans* cultures is always found associated with the mycelial and not the aqueous portion of the cultures.

72-0592. Tanabe, A.; Hori, S.; Toriumi, T.; Ikeda, M. (Dept. of Animal Husbandry, School of Agriculture, Okayama U., Okayama, Japan). **Studies on the cholinesterase of the chicken. II. Substrate specificity of true cholinesterase and distribution of cholinesterase types in tissues.** *Nippon Juigaku Zasshi (Jap. J. Vet. Sci.) 33(3): 111-120; 1971.* (20 references)

Substrate specificity of true cholinesterase was studied using brain tissue and skeletal muscle from white Leghorn chickens in order to clarify the distribution of cholinesterase types in various tissue. Cholinesterase activity of erythrocytes was also investigated. It was found that no substrate specificity pattern was discernible for true cholinesterase among brain, skeletal muscle, intestinal muscle, or heart ventricle. True cholinesterase hydrolyzed propionylcholine more rapidly than acetylcholine. Cholinesterase activity in chicken erythrocytes could not be detected using acetycholine, propionylcholine, butyrylcholine, and acetyl-β-methylcholine as substrates. The pseudo-cholinesterase of the pancreas hydrolyzed propionylcholine more rapidly than acetylcholine and butyrylcholine. The substrate specificity patterns of pancreatic cholinesterase resembled those of plasma cholinesterase. No diisopropylfluorophosphate-resistant pseudo-cholinesterase activity was found in the pancreas. The tissue studied fell into three groups on the basis of distribution of cholinesterase types. The brain and quadriceps femoris muscle exhibited true cholinesterase activity mainly. The intestinal muscle, gizzard and bursa of Fabricius possessed true cholinesterase and pseudocholinesterase activity at approximately the same rate. The proventriculus, liver, pancreas, intestinal mucosa and heart ventricle exhibited pseudo-cholinesterase activity for the most part.

72-0593. Tanabe, A.; Hori, S.; Toriumi, T.; Ikeda, M. Urakawa, N. (Dept. of Animal Husbandry, School of Agriculture, Okayama U., Okayama, Japan). **Studies on the cholinesterase of the chicken. I. Pseudocholinesterase of the plasma and diisopropylfluorophosphate-resistant pseudo-cholinesterase of the liver and other tissues.** *Nippon Juigaku Zasshi (Jap. J. Vet. Sci. 33(2): 69-79; 1971.* (22 references)

Substrate specificity patterns of plasma cholinesterase, difference in properties between liver cholinesterase and plasma or brain cholinesterase, and the distribution of liver cholinesterase in other tissues of white Leghorn chickens were studied. It was found that plasma cholinesterase belonged in the same activity category as pseudo-cholinesterase since both produced a substrate activity curve which was sigmoid in shape. Their activity against substrates increased in the order methylcholine, butyrylcholine, acetycholine, and propionylcholine. Similarly, on the basis of substrate activity pattern, cholinesterase present in liver, intestinal mucosa, and proventriculus could also be classified in the same category as pseudo-cholinesterase. The I50 concentration of tetra-isopropylpyrophosphoramide against diisopropylfluorophosphate-resistant pseudo-cholinesterase of the liver and other tissues was practically the same as that against psuedo-cholinesterase of the plasma. It was concluded that a cholinesterase similar to that present in chicken liver existed in the mucosa of the intestine and the proventriculus. There were differences, however, in sensitivity to diisopropylfluorophosphate and in the rates of hydrolysis of the four substrates used between the two types of cholinesterase.

72-0594. Sugiyama, H.; Kanki, T.; Shigematsu, H. (Sericultural Experiment Station, Suginami-ku, Tokyo, 166 Japan). **Difference in the metabolic fate of carbaryl between the silkworm, *Bombyx mori* L. (Lepidoptera: Bombycidae) and the black-tipped leafhopper, *Bothrogonia japonica* Ishihara (Hemiptera:Tittigellidae).** *Appl. Ent. Zool. 6(2): 57-62; 1971.* (12 references)

The metabolism of carbaryl in the silkworm larvae and in the black-tipped leafhopper, a mulberry tree pest, was studied in order to establish a basis for carbaryl's selective toxicity for the latter. Different toxic systems were found after topical application of ^{14}C-labeled carbaryl using dosages of about LD50. Toxic symptoms differed markedly for the two species. The larvae of the silkworm poisoned with carbaryl showed excitement and vomited gastric fluids about 15 min after application, and all the larvae became knocked down with the ataxia within 1 hr after application. At 3 hr after application most of the larvae revived from the toxic symptoms of ataxia and some of them began to eat mulberry leaves some 7 hr later. On the other hand, the black-tipped leafhopper that received an application of carbaryl became excited within 30 min and the first signs of "knock down" of adult insects with the ataxia was observed about 3 hr after and almost 30% of the insects were knocked down about 6 hr after application. In about 24 hr after application, the mortality was 60% under the present dose for investigation. Recovery from the toxic symptoms was not observed and the insects with the ataxia died without revival. In black-tipped leaf-

hopper adults carbaryl diminished slowly, and about 50% of the initial amount of carbaryl remained 8 hr after application. Water-soluble metabolites reached maximum levels 4 to 6 hr after application, but the amounts of those were almost the same as that transformed in the silkworms. The specific toxicity of carbaryl, closely related phylogenetically to insect species, may be represented by the specificity in the metabolism, absorption and excretion of carbaryl in insects, and the peculiar biological revival from toxic symptoms found in silkworm larvae treated with carbaryl should be explained by rapid release from the blocked state of the concerned enzymes, after the rapid transformation of carbaryl to less toxic metabolism.

72-0595. Mikosha, O. S.; Komisarenko, V. P. (Research Inst. of Endocrinology and Metabolism, Kiev, USSR). **Vplyv *o,p'*-dykhlordyfenildykhloretanu ta yoho analohiv na H-6-F-dehidrohenazu nadnyrkovykh zaloz sobak i morskykh svynok. [Effect of *o,p'*-DDD and its analogs on glucose-6-phosphate dehydrogenase of dog and guinea pig adrenals.]** *Ukr. Biochim. Zh. 43(3): 311-315; 1971.* (11 references) (Ukrainian)

The glucose-6-phosphate dehydrogenase activity in the adrenals of the dog is inhibited when 25 or 50 mg/kg of *o,p'*-DDD is administered. However, when guinea pigs were dosed with 100 mg/kg of *o,p'*-DDD for 20 days there was no change in enzyme activity. *In vitro* addition of *o,p'*-DDD, *p,p'*-DDD, and *o,p'*-DDT in a concentration of 67 μM to the homogenate of guinea pig adrenals inhibited (the most active being *o,p'*-DDD) the accumulation of reduced NADP. The addition of *o,p'*-DDD does not change the activity of glucose-6-phosphate dehydrogenase of the adrenal cytoplasmic action of guinea pigs; however, when using technical preparation certain inhibition may be observed.

72-0596. Fries, G. F.; Marrow, Jr., G. S.; Gordon, C. H. (Animal Science Research Division, ARS, USDA, Beltsville, MD 20705). **Excretion of *o,p'*-DDT in milk of cows.** *J. Dairy Sci. 54(12): 1870-1872; 1971.* (9 references)

The relative transfer of *o,p'*-DDT and *p,p'*-DDT from the diet to the milk of dairy cows was studied in order to establish a criterion for the authenticity of reports of milk contamination from environmental sources. It had previously been established that retention of *o,p'*-DDT in body fat of several species was considerably lower than *p,p'*-DDT. Eight Holstein cows were divided into 2 groups. One group received *o,p'*-DDT and the other received *p,p'*-DDT in their body feed for 20 days. Milk samples for residue analysis were collected before, during, and after 15 days of pesticide feeding. The residue was about 82% *o,p'*-DDD when *o,p'*-DDT was fed and about 76% *p,p'*-DDD when *p,p'*-DDT was fed. Since rumen microorganisms degrade *o,p'*-DDT and *p,p'*-DDT to the corresponding DDD analogs at similar rates *in vitro*, the lower amounts *o,p'*-compounds excreted in milk probably represent degradation by the animal after absorption. It was concluded that *o,p'*-analogs are not a significant contributor to the total DDT residue in milk. Reports of *o,p'*-DDT or *o,p'*-DDD greater than 4% of the corresponding *p,p'*-analog should be viewed with suspicion.

72-0597. Tackmann, W.; Lehmann, H. J. (Neurologische Klinik Essen der Ruhruniversitaet, Essen, Germany). **Refraktaerperiode und Serienimpulse im N. tibialis des Meerschweinchens bei akuter Thalliumpolyneuropathie. [Refractory period and impulse sequence recorded from the tibial nerves of guinea pigs with acute thallium polyneuropathy.]** *Z. Neurol. 199(12): 105-115; 1971.* (34 references) (German)

In order to examine the potential utility of the guinea pig as an experimental model for the study of axonal degeneration and to examine the variations in several electrophysiological parameters in the guinea pig during thallium intoxication, 9 guinea pigs were given 15 or 18 mg of thallium in a single dose. Signs of intoxication appeared within 24 hours. The tibial nerves were prepared and subjected to electrophysiological examination using the separating wall technique. The average conduction time of the fastest Aα fibers was reduced from 0.67 msec to 0.58 msec, and the conduction velocity increased from 6.25 m/sec to 72.4 m/sec. The values for the Aα and Aβ potential peaks were practically unchanged. The mean values of the amplitudes of the Aα and Aβ potential peaks are also essentially the same in poisoned animals and controls; however, the scattering of the values is greater in poisoned animals. The absolute refractory period is distinctly reduced in the damaged nerves, and accordingly, the amplitude of the action potential upon stimulation with frequent impulse series slightly increased. Morphological changes were observed in the peripheral and the central nervous system of poisoned animals. The axons in the tibial nerves examined were distinctly altered, the sheaths only secondarily. Thus both morphologically and electrophysiologically, the pattern of nerve damage following thallium intoxication in the guinea pig appears to correspond to pure axonal degeneration.

72-0598. Froslie, A. (The National Veterinary Inst., Oslo, Norway). **Ruminal metabolism and methemoglobin-forming effect of dinobuton in sheep.** *Acta Vet. Scand. 12(2): 300-302; 1971.* (6 references)

The metabolism of dinobuton (2-(1-methyl-*n*-propyl)-4,6-dinitrophenyl isopropyl carbonate) in fresh rumen fluid *in vitro* and the possibility of a methemoglobin-forming effect of dinobuton given intraruminally to sheep was investigated. It was found that dinobuton at concentrations of 150 g/ml is rapidly converted in fresh rumen fluid at pH 6.8 with the formation of 6-ANBP (2-(1-methyl-*n*-propyl)-4-nitro-6-aminophenol). The latter compound then decreased in

concentration until it was present only to the extent of 10%. Intraruminal application of dinobuton to a sheep led to a serious methemoglobinemia which lasted for several days. This was followed by hemolysis and a sharp drop in hemoglobin concentration. Death occurred after 4 days. Similar results were obtained by intraruminally applied DNBP (2-(1-methyl-*n*-propyl)-4,6-dinitrophenol) and 6-ANBP. It was concluded that dinobuton, DNBP, and 6-ANBP all show the same effect when given intraruminally to sheep, because they are metabolized in the same way. The end product of this ruminal metabolism the diaminophenol, DABP, is pointed out as the possible inducer of methemoglobinemia by DNBP poisoning in ruminants.

72-0599. Jefferies, D. J. (Monks Wood Experimental Stat., The Nature Conservancy, Abbots Ripton, Huntingdon, England). **Some sublethal effects of *p,p'*-DDT and its metabolite *p,p'*-DDE on breeding passerine birds.** *Meded. Fac. Landbouwwetensch. 36(1): 34-42; 1971.* (7 references)

One hundred and two passerine birds, the Bengalese Finch, *Lonchura striata*, were fed measured quantities of *p,p'*-DDT in the diet for six weeks before pairing in order to study the effect of *p,p'*-DDT on the various parameters of the reproductive cycle of a nidicolous species. The test diets were then continued until fledging of the young had occurred. Clutch sizes in the DDT-fed pairs were similar to those of the controls, but fertility, hatchability and fledging success were reduced. Several other effects of the DDT were noted. These were longer periods prior to ovulation, longer incubation and rearing periods, lighter eggs and smaller newly-hatched young. Tests with another group of 52 birds showed that feeding *p,p'*-DDE produces similar effects to those noted with the parent product.

72-0600. Walker, A. I. T.; Thorpe, E.; Robinson, J.; Baldwin, M. K. (Shell Research Ltd., Tunstall Lab., Sittingbourne, Kent, England). **Toxicity studies on the photoisomerisation product of dieldrin.** *Meded. Fac. Landbouwwetensch. 36(1): 398-409; 1971.* (20 references)

Toxicity studies on the photoisomerization product of dieldrin (PIPD) (10-oxa-3,6-*exo*-4,5,13,13-hexachlorohexacyclo(6,3,$1^{3\ 6}$, $1^{9\ 11}$,$0^{2\ 7}$,$0^{5\ 12}$) tridecane, were carried out on rats and dogs. Preliminary toxicity studies have shown the isomer to be more acutely toxic than HEOD, (1,2,3,4,10,10-hexachloro-6,7-epoxy-1,4,4a,5,6,7,8,8a-octahydro-*exo*-,4-*endo*-5,8-dimethanonaphthalene) the principal constituent of technical dieldrin. Samples of blood, fat, liver, and brain were analyzed for PIPD content. Slight hematological changes occurred in the rats, but not in the dogs. Histological changes were found in the liver and kidney of the rats, but no comparable changes were seen in the dogs. The tissue concentrations were related to intake. In female rats receiving up to 10 ppm PIPD, the tissue concentrations were two to fifteen times those in males. Kidney PIPD metabolite concentrations were greater than those of PIPD and ten times greater in males than in females. In dogs, the tissue concentrations of PIPD and the PIPD metabolite were similar in males and females. PIPD when given to rats and dogs for 13 weeks at dietary concentrations of 1 ppm, or an oral dose of 0.05 mg/kg equivalent to 1 ppm, produced no toxicological changes. This finding was in agreement with that of previous investigators.

72-0601. Heyndrickx, A.; van Hoof, F. (Dept. of Toxicology, State U. of Ghent, Belgium). **The acetylcholinesterase activity of carbamate pesticides upon plasma.** *Meded. Fac. Landbouwwetensch. 36(1): 425-435; 1971.* (5 references)

Sixteen carbamate pesticides, Zectran, promecarb, formetanate, Mesurol, Banol, propoxur, aminocarb, Bux, carbaryl, mobam, phenmedipham, pyrolan, isolan, dimetan, dimetilan, and GS-15171, (1-(carbethoxy)-ethyl-3-methyl-5-(*N,N*-dimethylcarbamyloxy)pyrazole), were studied to determine their potencies for inhibition of horse plasma acetylcholinesterase. The determination was based on the premise that inhibition of acetylcholinesterase results in a diminished liberation of acetic acid, which can be measured directly by titration with aqueous sodium hydroxide. Inhibition for each carbamate was measured at different concentrations over a period of one hour using an automatic titration apparatus and maintaining a constant pH of 7.4. By plotting inactivation values as a function of time, a clear value of the inhibition course was obtained. From the results the toxicity values of different carbamates can be calculated and the relative inhibition values compared with the inhibiting potency of some organophosphorus insecticides. It was impossible to compare *in vivo* toxicities with *in vitro* experiments.

72-0602. Libke, K. G.; Watson, D. F.; Bibb, T. L. (Dept. of Veterinary Science, Virginia Polytech. Inst. and State U., Blacksburg, VA). **Effects of a brushwood killer mixture on cattle.** *Mod. Vet. Pract. 52(7): 37-40; 1971.* (6 references)

To test the toxic effect of a brushwood killer containing 2,4-D, 2,4,5-T, and monosodium methyl arsonate (MSMA) on cattle eating sprayed foliage, cattle were exposed on pasture sprayed at the recommended herbicidal level and at four times the recommended level, by oral administration and by external contact. Spraying at the recommended level resulted in application of about 700 g each of 2,4-D and 2,4,5-T per acre and 56 g MSMA per acre. Groups of three heifers were placed on three-acre pasture lots at each of the three treatment levels (0, 1X and 4X recommended), with salt and water available *ad lib*. One heifer was given one LD50 of the herbicide perorally, and another 1.25X the LD50 per day until death occurred. In a third heifer, 2 oz per day were

applied to a shaved skin area. No deaths occurred in the animals grazed on unsprayed plots or plots sprayed at the recommended level; in the group on the oversprayed plot, one died on the twelfth day after consuming no food or water for several days. The topically and perorally treated animals also died following prolonged diarrhea and anorexia. Primary lesions observed in necropsied animals were hemorrhagic meningitis, with vascular congestion and hemorrhage in the parenchymatous organs, and catarrhal enteritis.

72-0603. Davis, P. W.; Wedemeyer, G. A. (Dept. of Pharmacology, U. of Washington School of Medicine, Seattle, WA). **Inhibition by organochlorine pesticides of Na^+, K^+-activated adenosine triphosphatase activity in the brain of rainbow trout.** *Proc. West. Pharmacol. Soc. 14: 47; 1971.*

Assays of Na^+, K^+-activated, Mg^{++}-dependent ATPase enzyme activity in brain microsomes of yearling rainbow trout yielded I50 values of $5 \times 10^{-6} M$ for dicofol, $3 \times 10^{-5} M$ for endosulfan, and $1 \times 10^{-4} M$ for DDT, expressed relative to a solvent control containing dimethylsulfoxide. I50 values for the three chlorinated hydrocarbons in gill and kidney microsomal preparations were similar to those found for brain microsomes. Whereas the brain microsomal preparations displayed the classic inhibition of NaK-ATPase by ouabain, gill microsomes were strikingly insensitive, undergoing only 2% inhibition at $10^{-4} M$ ouabain. It is suggested that the inhibition of NaK-ATPase in vital fish organs may be of causal significance in the observed toxicity of organochlorine pesticides to fish.

72-0604. van den Bercken, J.; Akkermans, L. M. A. (Inst. of Veterinary Pharmacology, and Toxicology, U. of Utrecht, Biltstraat 172, Utrecht, The Netherlands). **Negative temperature coefficient of the action of DDT in a sense organ.** *Eur. J. Pharmacol. 16: 241-244; 1971.* (14 references)

Clawed toads (*Xenopus laevis*) were exposed to DDT concentrations of 1-4 ppm in aquaria for 18 hours at 22-23°C. They were then removed, the lateral line organ prepared for recordings of electrical potential, and the preparation maintained at a constant temperature during the recordings. The lateral line organ in this animal displays irregular spontaneous activity in the absence of mechanical stimulation, generally consisting of two types of impulses originating from the two afferent nerve fibers. Following DDT treatment of the animals, single nerve impulses no longer occurred; all spikes were grouped in short trains. The number of repetitive spikes per train increased with increasing DDT concentration, time, and intensity of poisoning symptoms, as well as with decreasing temperature. Preparations from animals which did not show repetitive activity at room temperature after exposure to 1 or 2 ppm DDT sometimes did so upon cooling. The temperature effect was easily reversible. This repetitive activity is presumed not to originate in the lateral-line nerve.

72-0605. Lech, J. J. (Dept. of Pharmacology, The Medical Coll. of Wisconsin, Milwaukee, WI 53233). **Metabolism of 3-trifluoromethyl-4-nitrophenol in the rat.** *Toxicol. Appl. Pharmacol. 20(2): 216-226; 1971.* (7 references)

The metabolism of 3-trifluoromethyl-4-nitrophenol (TFM), a selective sea lamprey larvicide was investigated in rats. Analysis of urine from TFM-treated rats indicated that a portion of the injected TFM was reduced to 3-trifluoromethyl-4-aminophenol (RTFM) and that both TFM and RTFM were excreted as polar, acid labile compounds. At least some of the polar derivatives appear to be glucuronides since treatment of these materials with β-glucuronidase released both TFM and RTFM. Quantitative studies utilizing tritium-labeled TFM indicated that approximately 60% of the injected radioactivity was excreted in the urine in 24 hr, but only about 6% of that recovered was free unchanged TFM. (Author abstract by permission)

72-0606. Lahav, M.; Sarig, S. (Field Lab. for Research of Fish Diseases, Nir David, Israel). **Sensitivity of pond fish to cotnion (azinphosmethyl) and parathion.** *Bamidgeh 21(3): 67-74; 1970.* (9 references)

The toxicity of parathion and cotnion (azinphosmethyl) to carp, mullet, and tilapia was determined in aerated aquaria. The 96-hr LD100 for cotnion was 0.2 ppm for carp, 0.04 ppm for tilapia, and 0.008 ppm for mullet. For parathion, the 96-hr LD100 was 1 ppm for carp, 0.5 ppm for tilapia, and 0.125 ppm for mullet. The highest non lethal dosages for cotnion in 96 hr for carp, tilapia, and mullet were 0.1, 0.008, and 0.004 ppm respectively; whereas the dosages for parathion were 0.5, 0.25, and 0.1 ppm, respectively. The minimum lethal dose of cotnion for carp was 0.12 for a 10-day exposure, but continual periodic applications of 0.02 ppm in 96 hr were lethal, implying that the fish can accumulate the chemical. Of the three species tested, the mullet is the most sensitive to the two pesticides; it is eight times more sensitive to parathion and 20 times more sensitive to cotnion than the carp.

72-0607. Done, A. K.; Peart, A. J. (Dept. of Pediatrics, U. of Utah, Salt Lake City, UT). **Acute toxicities of arsenical herbicides.** *Clin. Toxicol. 4(3): 343-355; 1971.* (10 references)

The comparative acute toxicities of arsenical herbicides were studied by reviewing available reports of ingestions by humans and by administering the compounds orally to rats without first altering the characteristics of the compounds. Data from the two sources agree closely and indicate that the relative insoluble compounds such as arsenic trioxide or lead arsenate, if

not changed by prior attempts to solubilize, etc., represent far lesser acute toxic hazards than do such highly soluble compounds as the arsenic acids or their sodium salts. The organic alkane arsonate preparations have a low order of toxicity. The data do not support recent regulations proposed to limit household use of certain arsenicals. (Author abstract by permission)

72-0608. Gil, I.; Morales, J.; Martin, A.; Ruano, C.; Aragones, F. (Instituto "Jaime Ferran" de Microbiologia (CSIC), Madrid, Spain). **Influence of some pesticides on** *Azotobacter. Microbiol. Espan. 23(6): 271-277; 1970.* (11 references)

Eight pesticides were tested for their growth-inhibiting activity on two nitrogen-fixing microorganisms, *Azotobacter* and *Rhizobium.* The pesticides tested were: copper oxychloride; 2,4-dichlorophenoxyacetic acid butylester; 2,4-dichlorophenoxyacetic acid isobutylester; 2,3,5-trichlorophenoxyacetic acid isooctylester; vidden D (dichloropropanodichloropropene); folidol (parathion); phospherne (methylparathion); and pellitory extract. The growth medium was nitrogen-free mineral salt solution of Burk with 1.5% mannitol. Copper oxychloride was the only pesticide tested that inhibited growth completely at concentrations of 40 and 400 ppm. It had no effect at 4 ppm. The other pesticides tested had no effect on growth at the concentrations tested.

72-0609. Zoch, E. (Physiologisch-Chemischen Institut der Universitaet des Saarlandes, Homburg (Saar), Germany). **Die Wirkung organischer Phosphorsaeureester bzw. Phosphonsaeureester auf verschiedene Enzyme. [The effects of organic phosphoric acid esters and phosphonic acid esters on various enzymes.]** *Arzneim.-Forsch. 21: 181-187; 1971.* (37 references) (German)

The effects of various phosphoric acid esters and phosphonic acid esters on phosphatases, mitochondrial transport ATPase, trypsin, chymotrypsin, thrombin, diglyceridekinase, peroxidases, carboxylesterases and aliesterases of different animal origin and on acetylesterase from citrus fruit are surveyed. The influence of *O,O*-diisopropylfluorophosphate (DFP) on the activity of glycolytic enzymes is examined. The correlation between structure of the phosphorus compounds and inhibitory effect and the structure of the active centers are pointed out for carboxylesterase from pig liver and kidney, for acetylesterase from citrus fruit, and for the proteolytic enzymes trypsin and chymotrypsin.

72-0610. Oldiges, H. (Institut fuer Aerobiologie der Fraunhofer-Gesellschaft zur Foerderung der angewandten Forschung e.V., Grafschaft/Sauerland, Germany). **Untersuchungen zur Antidot-Behandlung percutaner Vergiftungen mit Alkyl-phosphaten an Ratten. [Studies on antidote treatment of percutaneous organophosphate poisoning on rats].** *Arzneim.-Forsch. 21: 1028-1030; 1971.* (14 references) (German)

Single application of the antidotes, 2-PAM (1-methyl-2-hydroxy-iminomethyl pyridinium iodide) or Toxogonin (obidoxime) was found to extend the time to first death of female albino rats after percutaneous application of the following organophosphates: parathion, DFP, paraoxon, dimethylaminocyanophosphoric acid ethylester (tabun), methylfluorophosphoric acid isopropylester (sarin), and methylfluorosphosphoric acid pinacolylester (soman). Both antidotes decreased the mortality rate after intoxication with parathion and paraoxon. For tabun the same result appeared only with application of obidoxime. Neither antidote had influence on intoxication with DFP, sarin, or soman.

72-0611. Engebretson, K. A.; Davison, K. L. (USDA Metabolism and Radiation Res. Lab., North Dakota State U., Fargo, ND 58102). **Dieldrin accumulation and excretion by rats fed phenobarbital and carbon.** *Bull. Environ. Contam. Toxicol. 6(5): 391-400; 1971.* (21 references)

Both phenobarbital and activated carbon have been suggested for therapeutic use in insecticide poisoning: carbon because of its adsorptive properties, and phenobarbital because of its dual effect of combatting symptoms of certain types of poisoning and inducing development of microsomal liver enzymes. Therefore, carbon and phenobarbital were fed to rats at 0 or 1 g and 0, 40, or 80 mg respectively either in diets containing 2 ppm of radiolabeled HEOD (in technical dieldrin) or in dieldrin-free diets following 6 weeks of dieldrin administration. Urine and feces were collected and radioanalyzed; livers were assayed for cytochrome P-450 after 6 weeks. Carbon-14 residues in the freeze-dried carcasses were analyzed by Parr bomb combustion. The results revealed that when carbon is administered while dieldrin is in the intestinal tract, it adsorbs the insecticide and promotes its excretion in the feces; if administered when dieldrin is already stored in tissue, it is ineffective. Phenobarbital, on the other hand, greatly reduced dieldrin storage whether administered simultaneously with the insecticide or after dieldrin accumulation.

72-0612. Peterle, A. F.; Peterle, T. J. (Dept. of Zoology, Ohio State U., Columbus, OH 43210). **The effect of DDT on aggression in laboratory mice.** *Bull. Environ. Contam. Toxicol. 6(5): 401-405; 1971.* (10 references)

Since it has been suggested that DDT ingestion influences hormone levels, and aggressive behavior is influenced by hormones, two groups of mice were matched in aggressive behavior prior to DDT administration, then placed on a diet containing 7.0 ppm DDT and retested for aggression over a 50-day period. Housing conditions were controlled to eliminate any other factors which might influence fighting behavior. Aggression was tested by placing pairs of mice (during the treatment

period, one from treated and one from control group) together in a neutral cage and observing for 3 minutes such actions as posturing, anal sniffing, avoidance and even biting. A "winner" was declared for each bout. The number of wins by the treated group dropped significantly over the test period, and the number of biting attacks made by the control group increased by almost twice. Testes weight/body weight ratios did not correlate with number of wins. The eight treated mice displayed brain levels of 0.79-1.07 ppm *p,p'*-DDT; residues in untreated animals' brains were below the GLC detection limit of 0.2 ppb.

72-0613. Wassermann, M.; Wassermann, D.; Kedar, E.; Djavaherian, M. (Dept. of Occupational Health, Hebrew U.-Hadassah Medical School, Jerusalem, Israel). **Immunological and detoxication interaction in *p,p'*-DDT fed rabbits.** *Bull. Environ. Contam. Toxicol. 6(5): 426-435; 1971.* (7 references)

In continuing studies on the effects of organochlorine insecticides on various biological processes, 200 ppm of *p,p'*-DDT were administered in the drinking water to a group of 18 rabbits for 38 days. On the 18th day, approximately half each of this group and of a control group received injections of heat-killed *Salmonella typhi* or sheep red blood cells (SRBC), respectively. Two further weekly injections were given. In the week after the third injection, three rabbits died, one in the DDT-*Salmonella* group and two in the DDT-SRBC group. One week after the last injection in both groups, and after an additional 7 weeks in the *Salmonella* group, blood samples were taken for antibody titer, serum globulin, and DDT determinations. Antibody titer against *Salmonella* was significantly lower in the group receiving DDT. Polyacrylamide gel electrophoresis and single radial immunodiffusion revealed significant decreases in total and 7S γ-globulins in the group receiving both *Salmonella* and DDT. Decreases observed in these parameters in the SRBC groups were not statistically significant. The content of DDT and its metabolites in the serum also differed strikingly in the two groups: 322.9 ppb in the DDT-*Salmonella* group and 164.7 ppb in the DDT-SRBC group. Thus some interaction appears to exist between immunological response to antigens and DDT detoxication.

72-0614. Pardini, R. S.; Heidker, J. C.; Payne, B. (Div. of Biochemistry, Fleischmann Coll. of Agriculture, U. of Nevada, Reno, NV 89507). **The effect of some cyclodiene pesticides, benzenehexachloride and toxaphene on mitochondrial electron transport.** *Bull. Environ. Contam. Toxicol. 6(5): 436-444; 1971.* (16 references)

The activity of two mitochondrial enzymes, the succinoxidase system and NADH oxidase, was studied *in vitro* in the presence of a number of organochlorine insecticides: BHC (isomer mixture), lindane, aldrin, photoaldrin, dieldrin, photodieldrin, endrin, heptachlor, heptachlor epoxide, chlordane, and toxaphene. It was found that heptachlor, chlordane, and toxaphene depressed the mitochondrial succinoxidase system to 5.8, 21.2, and 24.1% of the uninhibited controls, respectively. Four others were regarded as marginal inhibitors, since they depressed the activity to 25-85% of that of the untreated controls. Addition of BHC, aldrin, heptachlor, chlordane, and toxaphene to mitochondrial suspensions reduced mitochondrial NADH oxidase activity to 8.6, 10.1, and 3.9% of the uninhibited controls; dieldrin and heptachlor expoxide were considered non-inhibitory for this system. The remainder were marginal inhibitors. TMPD (*N,N,N',N'*-tetramethyl-*p*-phenylenediamine) was employed to determine the effect of the NADH inhibitors on cytochrome oxidase activity. The data showed that the inhibition of NADH oxidase by lindane, heptachlor, aldrin, chlordane, and toxaphene was bypassed by TMPD, whereas the inhibition by BHC was not.

72-0615. Creger, C. R.; Kubena, L. F. (Dept. of Poultry Science, Texas A&M U., College Station, TX 77843). **Lipotropic agents and DDT residue in birds and eggs.** *Bull. Environ. Contam. Toxicol. 6(5): 453-459; 1971.* (15 references)

To test the hypothesis that the lipotropic agents choline chloride and inositol could mobilize DDT and its metabolites as well as fat into the eggs of birds and thus reduce residual DDT levels, 15 Japanese quail were given a single dose of 50 mg DDT, then fed the basal diet or a diet containing 1.32 g choline chloride and 1.0 g inositol or 2.65 g choline chloride and 2.0 g inositol per kg. The seventh, 21st, and 28th eggs laid after the beginning of the experiment were collected from each bird and analyzed. After laying the 28th egg, the birds were killed and their carcasses freeze-dried and ground. The total carcass residue of DDT in the untreated group was 3.8, whereas in both the low- and high-level treatment groups it was 1.2. The carcass fat content of the treated groups, especially the high-level group, was also lower. The residues of DDT and its metabolites in the egg yolk were significantly lower in the treated groups (90.7, 65.5, and 56.2 ppm, respectively, for zero-, low-, and high-level groups in the seventh egg). Thus the increased rate of elimination from the body was apparently not due to excretion via egg yolk.

72-0616. Wrenn, T. R.; Weyant, J. R.; Fries, G. F.; Bitman, J. (Animal Science Res. Div., USDA, Beltsville, MD 20705). **Effect of several dietary levels of *o,p'*-DDT on reproduction and lactation in the rat.** *Bull. Environ. Contam. Toxicol. 6(5): 471-480; 1971.* (17 references)

The failure, in previous studies, to find any effect of feeding low levels of the most estrogenic DDT isomer (*o,p'*-DDT), on rat reproduction represents the incentive for seeking such effects at higher levels of DDT feeding. Groups of female rats were fed high levels of *o,p'*-DDT either in the diet *ad lib* or in oil by intubation. Repre-

sentatives of each group were periodically examined for vaginal patency or killed for whole-body analysis of DDT and its metabolites as well as determination of estrogenic effects in reproductive tissues. Some of the rats were permitted to bear young, and the characteristics of the litters determined. No effect of feeding high levels of *o,p'*-DDT (up to 40 ppm in the diet) was found in terms of sexual maturation indices, litter characteristics, or estrogenic stimulation indices, with the exception of a lower uterine water content in the treated animals killed at 6 weeks of age (3 weeks of treatment). It was noted that the whole-body DDT concentration in the rats which had borne and nursed two litters was appreciably lower than the concentrations of *o,p'*-DDT in the unmated rats of both 10 and 14 weeks of feeding, thus indicating that milk and concepti are significant routes for *o,p'*-DDT excretion.

72-0617. Roll, R. (Bundesgesundheitsamt, Max von Pettenkofer-Institut, Laboratorium fuer Ernaehrungshygiene, 1 Berlin 33, Germany). **Untersuchungen ueber die teratogene Wirkung von 2,4,5-T bei Maeusen. [Studies of the teratogenic effect of 2,4,5-T in mice].** *Food Cosmet. Toxicol. 9(5): 671-676; 1971.* (3 references) (German)

A prenatal toxicological investigation of 2,4,5-T (2,4,5-trichlorophenoxyacetic acid) on mice is described. The 2,4,5-T was 99.6% pure (m.p. 153°-154°C) with 0.1 ppm dioxin (Dow Method) and 0.05±0.02 ppm dioxin (FDA Method). It was shown that there was a significant increase in cleft palate, in addition to embryotoxic effects, following oral administration of 2,4,5-T (with a 2,3,7,8-tetrachlorodibenzo-*p*-dioxin content below 0.1 or 0.05 ppm) in a dose of 35 to 130 mg/kg to NMRI mice from 6 to 15 days of pregnancy. A dose of 20 mg/kg/day was established as the "teratogenic no-effect level."

72-0618. Patocka, J. (J. E. Purkyne Military Res. Inst. for Postgraduate Training, Hradec Kralove, Czechoslovakia). **Inhibitory effect of isopropyl methyl phosphonofluoridate on tissue cholinesterases of mouse, rat, and guinea pig *in vitro*.** *Coll. Czech. Chem. Commun. 36(10): 3476-3481; 1971.* (19 references)

The interaction *in vitro* of isopropyl methyl phosphonofluoridate (IMPF, sarin) with certain tissue cholinesterases of the mouse, rat, and guinea pig are described. Cholinesterase activity was measured by the electrometric method in semiautomatic equipment at a pH of 8.0. The affinity of IMPF for cholinesterases from the animals studied is very similar for the individual organs. An exception represents the enzyme from guinea pig brain and lungs. The enzyme from the brain shows an affinity for the inhibitor which is by one order higher than the affinity of the same enzyme from mouse or rat. By contrast, the enzyme from guinea pig lungs is not very sensitive to IMPF and can be thus described as a resistant type. The interaction was characterized as allosteric inhibition and described in terms of I^{50}-constants, Hill coefficient values, and size of bimolecular rate constants.

72-0619. Brooks, R. E. (Dept. of Pathology, U. of Oregon Medical School, Portland, OR 97201). **Ultrastructure of lung lesions produced by ingested chemicals. I. Effect of the herbicide paraquat on mouse lung.** *Lab. Invest. 25(6): 536-545; 1971.* (31 references)

An electron microscopic study of the pulmonary tissue from mice that received drinking water containing 50 to 300 ppm of the herbicide paraquat for varying lengths of time was carried out in order to elucidate the mechanism of lung reaction to the chemical. The lung reactions were found to be similar to those described for chronic interstitial pneumonia, which is thought to result from initial alveolar capillary damage. Lungs of most mice receiving higher concentrations of paraquat showed a noninfectious pneumonic response. Capillary alteration in the form of sporadic, focal endothelial cell swelling, blebbing, and loosening from the underlying basal lamina represented the earliest morphologically recognizable stage in this response. Endothelial cell membrane breakage or loss of cell junction integrity was not observed. Erythrocyte and platelet aggregation in small veins and capillaries, intraseptal edema, and damage to some type-A alveolar epithelial cells also occurred as early effects. In later stages of lung response to injury by paraquat, exudate was present in some alveolar air spaces and bronchiolar lamina. Also, neutrophils and macrophages invaded alveolar septa as well as air spaces. Fibroblasts increased in number within alveolar septa and infiltrated exudate-filled alveoli. Based on the reported effects of paraquat on plant cells and liver mitrochondrial and microsomal fractions, it is suggested that paraquat in lungs causes peroxidation of cell membrane lipids, leading to capillary leakage.

72-0620. Jovic, R.; Vojvodic, V. (Inst. Technicko-Medicinsku Zastitu, Yugoslavia). **Akutna toksicnost i terapijske mogucnosti pri eksperimentalnim trovanjima somanom. [Acute toxicity and therapy of soman administered to experimental animals.]** *Vojnosanit. Pregl. 28(4): 186-189; 1971.* (18 references) (Serbo-Croatian)

The acute LD50 of soman was determined for both subcutaneous and intramuscular administration to mice, rats, guinea pigs, rabbits, cats, and dogs. A tentative index of toxicity for man is extrapolated from these data. The therapeutic efficacy of cholinolytics such as atropine and benactyzine and of cholinesterase activators (alone or in combination) in mice, rats, and cats given lethal doses of soman was studied. The success of poisoning therapy in animals or man will always be determined by the knowledge of the toxicological dynamics and their mechanisms.

72-0621. Chevrel, B.; Hecht, Y. (Hopital Saint-Antonine, Paris, France). **Physiopathologie et traitement des icteres du nouveau-ne. [Physiopathology and treatment of jaundice in new-borns.]** *Presse Med. 78(46): 2015-2017; 1970.* (45 references) (French)

Infantile jaundice can successfully be treated with phenobarbital, which activates the bilirubin conjugating enzyme system. Among others, dicophane (derived from DDT, chlorodiphenyl trichloroethane content 70%) was considered as a possible substitute for phenobarbital. In one case of Gilbert's disease, a definite decrease of bilirubinemia, and the normalization of the menthol glucuronidation test was observed even long after the treatment. Dicophane accumulated in the fatty tissues, and its mobilization occurred very slowly. In a test carried out on rats, increases of 27% and 16% were obtained for glucuronyl transferase activity and cytochrome P 450 activity, respectively. The total weight of the liver was also increased. This substance had no toxic or secondary effects.

See also 72-0429 72-0431 72-0445 72-0448 72-0453 72-0459 72-0463 72-0470 72-0472 72-0505 72-0506 72-0519 72-0530 72-0531 72-0535 72-0540 72-0542 72-0551 72-0645 72-0648

72-0622. Widmark, G. (Inst. of Analytical Chemistry, U. of Stockholm, Stockholm 50, Sweden). **Possible limits of ultramicro analysis.** *Pesticide Identification at the Residue Level. Advances in Chemistry Series 104: 1-10; 1971.* (3 references)

Modern methods of residue analysis will possibly reach the limits of sensitivity. Increasing sensitivity marks the two main paths taken by analytical chemistry development. Quantitation, marked by a strong requirement for simplicity, is the first path; identification, with the need for complex information, hopefully is the second path. When using on-line data acquisition systems, gas chromatography and mass spectrometry (combination instruments) can yield information for identification at high sensitivity. When the combination of instruments is extended to cover GC/MS/DAS/computer, a further increase in selectivity and sensitivity is foreseen. A "map of tracer cosmos" illustrates the ultimate limits of ultramicro analysis.

72-0623. Cochrane, W. P.; Chau, A. S. Y. (Analytical Services Section, Plant Products Division, Dept. of Agriculture, Ottawa, Ontario, Canada). **Chemical derivatization techniques for confirmation of organochlorine residue identity.** *Pesticides Identification at the Residue Level. Advances in Chemistry Series 104: 11-26; 1971.* (63 references)

As a consequence of obstructions from co-extracted pesticide compounds and naturally-occurring products as well as outside contamination, misidentification in organochlorine pesticide residue analysis by thin-layer and gas chromatography occur. Chemical derivatization is an availing method for verification of residue identity. The most convential procedures used are: oxidation, rearrangement, addition, reduction, dehydrochlorination and dechlorination. For the correct choice and application of a derivatization reaction a table of confirmatory tests for organochlorine residue is given. The ranges for sensitivity are from 0.01 to 0.1 ppm. Also discussed is the method of formation of some chlordane derivatives.

72-0624. Villeneuve, D. C. (Food and Drug Directorate, Dept. of National Health and Welfare, Ottawa, Canada). **A review of enzymatic techniques used for pesticide residue analysis.** *Pesticides Identification at the Residue Level. Advances in Chemistry Series 104: 27-38; 1971.* (57 references)

The use of enzymatic techniques for pesticide residue analysis is reviewed. The two procedures which cover the majority of these techniques are anticholinesterase and anticarboxylesterase. These techniques are described with pertinency to the different methods of assay, theory behind their use, limits of detection, and advantages and disadvantages. The usefulness of other enzymatic techniques is also discussed.

72-0625. Aue, W. A. (U. of Missouri, Columbia, MO 65201). **Flame detectors for residue analysis by GLC.** *Pesticides Identification at the Residue Level. Advances in Chemistry Series 104: 39-72; 1971.* (78 references)

Three gas chromatographic detectors (flame ionization, flame photometric, alkali-flame) are discussed. The residue chemist reviews these detectors in reference to sensitivity and selectivity limits, methods of operation and advantages and disadvantages. The author's own group has been involved in recent research and they present the magnitude and range of the negative alkali flame detector response; smooth and clean alkali salt surface, a large bead bore and high hydrogen and low carrier gas flows are characteristic of this detector which has been used for qualitative and semiquantitative structure analysis by GLC.

72-0626. Westlake, W. E. (Dept. of Entomology, U. of California, Riverside, CA 92502). **Gas chromatographic measurement and identification of pesticide residues with electron capture, microcoulometric, and electrical conductivity detectors.** *Pesticides Identification at the Residue Level. Advances in Chemistry Series 104: 73-80; 1971.* (20 references)

Electron capture, microcoulometric, and electrical conductivity detectors are discussed. The gas chromatograph gives a high degree of assurance as to the identity of the compound being detected but it is not capable of giving specific qualitative information. The electron capture detector is almost useless for qualitative identification but is unsurpassed for detecting very minute quantities of many compounds. The microcoulometric detector system is used for the confirmation of recorder responses because of its high degree of specificity; when the presence of an organochlorine pesticide is indicated the electron capture is used which is specific for nitrogen, sulfur, or chlorine. Due to this specificity-and also retention time data-one can be highly assured of the identity of the compound. Organic iodine or bromine is measured by the electrolytic conductivity detector.

72-0627. Blinn, R. C. (American Cyanamid Co., Princeton, NJ 08540). **Infrared microtechniques useful for identification of pesticides at the microgram level.** *Pesticides Identification at the Residue Level. Advances in Chemistry Series 104: 81-94; 1971.* (30 references)

Milligram amounts of organic compounds can be identified by infrared spectrophotometry. During the course of recent years this utility has been extended to microgram amounts of material by development of microtechniques. Conditions involved in attaining this sensitivity and in lessening the development of contamination are discussed. Thin-layer chromatography is used to isolate pesticides from the sample for infrared characterization; trapping gas chromatographic effluents is also useful. Several methods for preparing micro potassium bromide pellets are related. The use of micro multiple internal reflectance is also discussed.

72-0628. Aly, O. M.; Faust, S. D.; Suffet, I. H. (Dept. of Environmental Sciences, Rutgers U., New Brunswick, NJ 08903). **Ultraviolet spectrophotometry in residue analysis; spectra-structure correlations.** *Pesticides Identification at the Residue Level. Advances in Chemistry Series 104: 95-118; 1971.* (34 references)

Ultraviolet spectrophotometry is used for confirming the identification of pesticide residues. An interrelation between UV spectrum and the structure of some pesticides is discussed. The knowledge of this interrelation may be an aid to the analyst in designing analytical procedures and supply hints about the general type of chromophore present. UV spectra together with IR, NMR, and mass spectroscopy can lead to structural suggestions which are valuable to the pesticide analyst. There have been methods utilized for the analysis of pesticides on the submicrogram level and these are also discussed.

72-0629. Getz, M. E. (Entomology Research Div., Agricultural Research Service, U.S. Dept. of Agriculture, Beltsville, MD 20705). **Past, present, and future application of paper and thin-layer chromatography (TLC) for determining pesticide residues.** *Pesticides Identification at the Residue Level. Advances in Chemistry Series 104: 119-131; 1971.* (42 references)

Paper and TLC have been utilized for qualitative identification and semiquantitative estimation. It has been demonstrated by developments in optical scanning instrumentation and refinements in spotting that these procedures can be quantitative. Three things are essential for the accuracy and precision of this approach: uniformity of chromatographic layer, uniform spotting of samples and standards, and uniform application of chromogenic reagents. It is foreseeable that quantitative determination by this technique will increase in the future.

72-0630. Biros, F. J. (Perrine Primate Research Branch, Div. of Pesticide Chemistry and Toxicology, Food and Drug Administration, U.S. Dept. of Health, Education, and Welfare, Perrine FL 33157). **Applications of combined gas chromatography-mass spectrometry to pesticide residue identifications.** *Pesticides Identification at the Residue Level. Advances in Chemistry Series 104: 132-150; 1971.* (31 references)

Gas chromatographic-mass spectrometric confirmation and identification of pesticide residues is possible by means of several individual and multiresidue analytical methods. The following have been considered: the analysis of intact and derivatized phenolic residues such as pentachlorophenol and 1-naphthyl chloroacetate, organophosphorus insecticide metabolic and hydrolytic products including *O,O*-diethyl *O*-methyl phosphorothiolate, *O,O*-diethyl *S*-methyl phosphorothiolate, and *O,O*-diethyl *O*-methyl phosphate, several organochlorine pesticides of the DDT and cyclodiene type, phenoxyalkanoic acid herbicide exposure and methodology studies involving 2,4-D and 2,4,5-T, and polychlorinated biphenyl residues. By the combined technique, approved residue analytical methodology and gas chromatographic column technology are directly pertinent to the analysis of human, animal, and environmental substrates. Conclusive and definitive confirmation of residue identity is provided by evaluation of mass spectral fragmentation pathways.

72-0631. Elgar, K. E. (Shell Research Ltd., Woodstock Agricultural Research Centre, Sittingbourne, Kent, England). **The identification of pesticides at residue concentrations.** *Pesticides Identification at the Residue Level. Advances in Chemistry Series 104: 151-161; 1971.* (28 references)

Thin-layer chromatography, paper chromatography, or *p*-values do not give independent data for the identity of a compound because they share the same property in achieving separations of mixtures; also highly correlated are GLC retention times. This close correlation leads to a more careful decision in choosing a confirmatory technique. There is a need for simpler operations (such as formation of chemical derivatives) although, such methods as GC/MS are being studied. There have been a number of reactions which were suitable for confirming of residues of aldrin and dieldrin.

72-0632. Ercegovich, C. D. (Dept. of Entomology and Pesticide Research Laboratory, Pennsylvania State U., University Park, PA 16802). **Analysis of pesticide residues: immunological techniques.** *Pesticides Identification at the Residue Level. Advances in Chemistry Series 104: 162-177; 1971.* (26 references)

Only three separate research groups have done investigations on immunological methods for analyzing pesticides and their degradation products. Antisera specific for DDA, a metabolite of DDT, and for malathion were developed by two of the groups. The third group used immunological methods to detect parathion, aminotriazole (amitrole), and several degradation products. The practicality of these methods was not shown for actual residue analysis; nevertheless, their results show that immunological methods have a potential for detecting pesticides. Immunological methods as supplemental methods for rapid screening and confirmatory test for pesticide analysis are urged and the advantages and disadvantages of these methods are discussed.

72-0633. Gesser, H. D.; Chow, A.; Davis, F. C.; Uthe, J. F.; Reinke, J. (Chemistry Dept., U. of Manitoba, Winnipeg, Manitoba, Canada). **The extraction and recovery of polychlorinated biphenyls (PCB) using porous polyurethane foam.** *Anal. Lett. 4(12): 883-886; 1971.* (10 references)

A new, fast and effective method has been devel-

oped for concentration and extraction of PCB from water. PCB is passed through an absorption column made of porous polyurethane foam and then is eluted with acetone and hexane. The dried elutant is then analyzed by gas chromatography. The polyurethane foam is not specific for PCB but will absorb organochlorine pesticides as well.

72-0634. Kratky, B. A. (Purdue U., West Lafayette, IN). **Herbicide bioassays; water-soil-herbicide-plant relationships.** *Diss. Abstr. Int. 32(6): 3089B; 1971.*

Three rapid bioassays were tested on 42 herbicides having several different modes of action. A 50% or greater inhibition of growth was found at 1 ppm with 31 herbicides in one or more of the bioassays. Of the remaining 11 herbicides, 7 were detected at 10 ppm, 2 at 20 ppm and 2 at 30 ppm. The bioassays used were a *Chlorella* bioassay, a root bioassay using sorghum, oat and cucumber and a shoot bioassay using sorghum and oat. The *Chlorella* bioassay was especially sensitive to photosynthetic and respiratory inhibitors but not sensitive to herbicides with other modes of action, whereas the root and/or shoot bioassays were sensitive to most of the herbicides. The use of the three bioassays simultaneously was suggested as a possible method for primary screening of herbicides. Experiments were conducted on water-soil-herbicide-plant relationships. When the water/soil ratio was increased from 0.6:1 to 32.0:1 on a Chalmers silty clay loam the total adsorption of terbacil (3-*tert*-butyl-5-chloro-6-methyluracil) by the soil decreased 4.5 fold. This occurred because the total amount of terbacil in solution increased from 9% to 80% of the amount applied despite a decrease in concentration in the soil solution. For the same degree of fresh weight inhibition of sorghum plants, a greater concentration of terbacil was required in the soil solution for a Bloomfield fine sand (0.4% organic matter) than for a Chalmers silty clay loam (24% organic matter). Adsorption of terbacil increased as the soil organic matter increased. Increasing the soil moisture content increases the effectiveness of terbacil. (Author abstract by permission, modified, copies of the thesis are available from University Microfilms, order No. 72-1904)

72-0635. Karasek, F. W. (U. of Waterloo, Waterloo, Ontario, Canada). **Plasma chromatography of the polychlorinated biphenyls.** *Anal. Chem. 43(14): 1982-1986; 1971.* (12 references)

Both positive and negative plasmagram patterns have been obtained for a series of PCB compounds containing one to ten chlorine atoms. The plasmagrams give characteristic qualitative data. Strong positive plasmagrams are associated with weak or nonexistent negative ones; the converse is also true. Negative response increases with the degree of chlorine substitution of the PCB. There is a correspondence between relative electron-capture detector responses and the intensity of the PCB-ion complexes in the negative plasmagrams. (Author abstract by permission)

72-0636. DeLacy, T. P.; Kennard, C. H. L. (Dept. of Chemistry, U. of Queensland, Brisbane, Queensland 4067, Australia). **X-ray crystal structure of DDT; 1,1-bis-(*p*-chlorophenyl)-2,2,2-trichloroethane.** *J. Chem. Soc. D. Chem. Comm. 19: 1208-1209; 1971.* (5 references)

Attempts to explain the mode of action of DDT with the aid of steric theories have been hampered by lack of complete crystal structure data. In this report, the crystal structure of DDT was determined by X-ray crystallography, and was found to differ from the conventional symmetrical picture of the compound by the existence of different angles between the planes of the apex chlorine atoms and the planes of the phenyl groups. The absence of strong intermolecular forces in the unit cell makes it likely that the stereochemistry of the molecule in the biological system is similar to that in the crystal.

72-0637. Sitzmann, F. C. (Kinderklinik der Univ. Erlanger-Nuernberg, Germany) **Einfache Methoden zur Bestimmung der Aktivitaet der Cholinesterase im Serum. [Simple methods of determining serum cholinesterase activity.]** *Internist, Prax. 11: 605-608; 1971.* (12 references) (German)

Four methods for rapid serum cholinesterase determination are described, all of which gave good results in comparison experiments with more detailed quantitative tests. Two of these require the use of a spectrophotometer. The first, available as a test kit containing the required reagents, is based on the measurement of the color intensity produced by coupling of thiocholine (produced from acetylcholine cleavage) with a dye (dithiobisnitrobenzoic acid). The second is similar, except that it uses butytrythiocholine iodide instead of acetylthiocholine iodide as the substrate, and is thus less sensitive to slight hemolysis. The two rapid (desk-top) test methods, the Zymotest and the Merckotest, both employ reagent-impregnated test papers. In one, the time required for the test specimen strip to reach the color of the reference strip is measured; in the other, the color change units in a certain time interval are used in the calaculation. In each case, it is necessary to use the correct calculation factors and note the units in which the results are expressed.

72-0638. Johnsen, R. E.; Starr, R. I. (Dept. of Entomology, Colorado State U., Fort Collins, CO 80521). **Ultrarapid extraction of insecticides from soil using a new ultrasonic technique.** *J. Agr. Food Chem. 20(1): 48-51; 1972.* (18 references)

The Polytron, a high specific intensity ultrasonic generator, was used to extract insecticide residues from various soils. This system was compared with a second ultrasonic source and with Soxhlet, roller, and blender extraction procedures. The solvent of choice was acetone. Soil moisture, type, and organic matter content

were not critical factors in affecting quantitative recovery. Extraction for only 30 sec gave generally better recovery values than did other methods, including 8 hr of Soxhlet extraction. (Author abstract reprinted by permission of the American Chemical Society)

72-0639. Suffet, I. H.; Faust, S. D. (Dept. of Chemistry, Environmental Engineering and Science Program, Drexel U., Philadelphia, PA 19104). **The *p*-value approach to quantitative liquid-liquid extraction of pesticides from water. 1. organophosphates: choice of pH and solvent.** *J. Agr. Food Chem. 20(1): 52-56; 1972.* (26 references)

The idea of *p*-value for confirmation of insecticide identity and for clean-up of insecticides at the nanogram level has been developed. In this paper the concept of using the *p*-value for determination of the parameters of solvent choice for quantitative liquid-liquid extraction of organophosphate pesticides from water are reported. The *p*-value method is modified to suit the present application. The *p*-value can be used to determine the quantitative extraction of the parent, oxon, and hydrolysis products of diazinon, parathion, malathion, and Baytex (fenthion). (Author abstract reprinted by permission of the American Chemical Society)

72-0640. Haque, R.; Lilley, S. (Dept. of Agricultural Chemistry and Environmental Health Science Center, Oregon State U., Corvallis, OR 97331). **Infrared spectroscopic studies of charge-transfer complexes of diquat and paraquat.** *J. Agr. Food. Chem. 20(1): 57-58; 1972.* (8 references)

The formation of charge-transfer complexes between diquat or paraquat and halide (Cl^-, Br^-, and I^-) ions is reported by infrared spectroscopic technique. The vibrational frequency bands in diquat or paraquat depend on the nature of the anion (Cl^-, Br^- I^-). The strong band at 854 cm^{-1} in paraquat dichloride and 793 cm^{-1} in diquat dibromide, which were assigned to the umbrella mode, shifted to lower frequency with the decreasing electronegativity of the anion (Cl^- to I^-). The results are compared with pyridinium halide complexes and with diquat or paraquat complexes with montmorillonite. (Author abstract reprinted by permission of the American Chemical Society).

72-0641. Devine, J. M; Sisken, H. R. (Lake Ontario Environmental Lab., State University College, Oswego, NY 13126). **Use of the flame photometric detector for determining residues of Omite [2-(*p-tert*-butylphenoxy)cyclohexyl propargyl sulfite] in various crops.** *J. Agr. Food Chem. 20(1): 59-61; 1972.* (2 references)

A gas chromatographic method is described for the determination of Omite residues in various crops. After extraction and column cleanup, Omite is determined using a flame photometric detector equipped with a sulfur filter. Recovery of Omite from various fruits was 96± 12% and from nuts it was 75± 16%. Results from the method compare favorably with exhaustive extractions of field-treated samples. The method is sensitive to 0.1 ppm for all crops tested. (Author abstract reprinted by permission of the American Chemical Society)

72-0642. Santi, R.; Canale, G.; Radice, M.; Pizzingrilli, G. (Direzione Generale Ricerche e Brevetti, Istituto Ricerche Agrarie Montecatini-Edison, Milano, Italy). **Spectrophotofluorometric determination of the hydrolyzed residues of 2-fluoroethyl-4-biphenylacetate (fluenethyl) in some fruits.** *J. Agr. Food Chem. 20(1): 62-64; 1972.* (4 references)

A method has been developed for the determination of fluenethyl residues in apples, grapes, peaches, pears, and plums. This method is based on the extraction of the acaricide with methylene chloride, followed by liquid-liquid partitioning and thin-layer chromatographic cleanup, hydrolysis, and spectrophotofluorometric assay down to 1 ppb. (Author abstract reprinted by permission of the American Chemical Society)

72-0643. Waggoner, T. B. (Chemagro, a Division of Baychem Corporation, P.O. Box 4913, Kansas City, MO 64120). **Metabolism of Nemacur [ethyl 4-(methylthio)-m-tolyl isopropylphosphoramidate] and identification of two metabolites in plants.** *J. Agr. Food Chem. 20(1): 157-160; 1972.* (8 references)

Nemacur-^{14}C,^{3}H (I) was injected into the stems of beans, tomatoes, peanuts, and potatoes and the plants were harvested at 7, 14, 21, and 28 days. Two major metabolites were identified by thin-layer chromatography, isotopic ratios, infrared, and mass spectrometry as II and III. Two minor metabolites, IV and V, consisting of intact phosphoramidate structures, never accounted for more than 1.5 and 0.2%, respectively, of the total residue. Their exact structures were not determined. The significant acetylcholinesterase inhibiting residues consisted of I, II, and III, and the remainder of the radioactivity consisted of braakdown products. Compounds II-IV were more active as acetylcholinesterase inhibitors than I. The phenols from I and III were detected in the organosoluble fraction. An analytical residue method for plants should include I-III. (Author abstract reprinted by permission of the American Chemical Society)

72-0644. Woodham, D. W.; Loftis, C. D.; Collier, C. W. (United States Dept. of Agriculture, Agricultural Research Service, Plant Protection Division, Gulfport, MS 39501). **Identification of the gas chromatographic dieldrin and endrin peaks by chemical conversion.** *J. Agr. Food Chem. 20(1): 163-165; 1972.* (10 references)

A simple and rapid method is described for the simultaneous confirmation of dieldrin and endrin residues in soil, sediment, water, corn grain, corn stalks, and soybeans. This technique employs a one-step sample treatment with 10% boron trichloride in 2-chloroethanol for the conversion of dieldrin and endrin into their cor-

responding derivatives. The dieldrin and endrin conversions require 2 hr and 10 min reaction times, respectively, and parent residues can be confirmed at the 0.01-ppm level. This method has been employed in the Pesticides Monitoring Program on various types of samples and has been very helpful in identifying these pesticides when suspected. (Author abstract reprinted by permission of the American Chemical Society)

72-0645. McConnell, E. E.; van Rensburg, I. B. J.; Minne, J. A. (Armed Forces Inst. of Pathology, Washington, DC). **A rapid test for the diagnosis of strychnine poisoning.** *J. S. Afr. Vet. Med. Ass. 42(1): 81-84; 1971.* (6 references)

An elementary, quick, and dependable method for the diagnosis of strychnine poisoning is presented. A weanling mouse is injected intraperitoneally with a sampling of the stomach content of the victim; the result is positive if the mouse dies. Typical signs of the poisoning occur and this together with history, and/or results of the testing procedure can serve to differentiate strychnine poisoning from other types of poisonings (chlorinated hydrocarbons, parathion, garbage intoxication).

72-0646. Gutsche, B.; Herrmann, R. (Abteilung fuer Medizinische Physik, Univ.-Hautklinik, Giessen, Germany). **Bandenstruktur von HPO und S2 in kuehlen Flammen fuer die Analytik von phosphor- und schwefelhaltigen Insektiziden. [Band structure of HPO and S2 in cool flames for the analysis of phosphorus- and sulfur-containing insecticides.]** *Deut. Lebensm.-Rundsch. 67(7): 243; 1971.* (1 reference) (German)

Studies performed on diethylphosphite and dimethylsulfoxide with a view toward the flame spectrometry of insecticides containing both sulfur and phosphorus revealed that the only overlapping which occurs for the bands of these two elements is slight and occurs in the vicinity of 500 nm. Therefore, by using the somewhat weaker band line at 544 nm for the P-analysis and the somewhat weaker band line at 380 nm for the S-analysis, it should be possible to avoid any interference due to offshoots of either band system.

72-0647. Muthu, M.; Gundo Rao, G. R.; Majumder, S. K. (Central Food Technological Research Inst., Mysore 2A, India). **A bio-assay method for determining fumigant concentrations in air.** *Int. Pest Control 13(4): 11-14; 1971.* (7 references)

A bio-assay method for assessing the effectiveness of a fumigation treatment was devised in which the fumigated sample was aspirated from the fumigated space through tubes containing insects and measuring the knock-down time. Figures for gas concentration were then obtained by dividing the knock-down time by the product of concentration and time. The method may be used in situations where a chemical analysis or use of instrumental methods is not possible for estimating as concentrations during the progress of a fumigation. The bio-assay method was found applicable to fumigants such as acrylonitrile, carbon disulfide, carbon tetrachloride, chloropicrin, methyl bromide and phosphine. However, the method was unsuccessful when applied to the measurement of the fumigants, ethylene dibromide and ethylene dichloride. Special care is needed when applying the bio-assay method to ethylene oxide since it is administered along with high concentrations of carbon dioxide to act as a fire depressant. A suitable scrubber is recommended to eliminate error in measurement. The bio-assay fumigant concentration values were compared with chemical analysis in field tests to determine the dependability of the method.

72-0648. Bowen, I. D.; Lloyd, D. C. (Department of Zoology, University College, Cardiff, P. O. Box 78, Cardiff CF1 1XL, Great Britain). **A technique for the electron cytochemical localization of the site of carbaryl metabolism.** *J. Invert. Path. 18(2): 183-190; 1971.* (23 references)

Carbaryl (1-naphthyl-*N*-methycarbamate) is an increasingly important pesticide for insect and terrestrial mollusc control. Since little is presently known of the mode of action of this compound, a technique is described for localization of the site of metabolism. By coupling the 1-naphthol released from metabolically hydrolyzed carbaryl with *p*-nitrobenzenediazonium fluoborate an electron-dense azo dye was produced which was then used for electron-cytochemical study. Digestive glands of adult slugs, *Agriolimax reticulatus,* were used for localization studies and the brains of adult specimens of *Arion ater* were used to study esterase inhibition. It was found that the azo dye was limited to the calcium cells of the digestive gland, and, specifically, confined to the cytoplasm. Also, a positive reaction for esterase was found associated with nerve cells in the brain of the slug, indicating a general inhibition of cholinesterase activity. It was concluded that this technique may successfully serve to localize an early site of carbaryl metabolism by direct visualization of reaction products, and to demonstrate, indirectly, possible sites of poisoning through esterase inhibition.

72-0649. Trombetti, G.; Gordini, T. (Societa Italo Americana Prodotti Antiparassitari, SIAPA, Centro Esperienze e Ricerche, 40015 Galliera, Bologna, Italy). **Quantitative determination of the γ-isomer of BHC in technical products and formulations.** *J. Chromatogr. 60(2): 251-252; 1971.* (9 references)

A rapid method for the separation of the five main isomers of BHC and the quantitative determination of the γ-isomer (lindane) by means of a stationary phase widely used in the chromatography of pesticides is described. By this procedure, technical BHC samples containing 14-15%, 46-48% and 60% of γ-isomer were analyzed and the results were in good agreement with those obtained by partition chromatography. Emulsifiable formulations were determined similarly. Dusts and wettable powders were analyzed by gas-liquid chromatography

after extraction. Carbon disulfide solutions were used because they permitted chromatograms to be obtained with negligible solvent tailing. For rapid and simple performance, gas-liquid chromatography methods can compare favorably with the official analytical methods based on partition chromatography on a silica column and IR spectrophotometric determination of an aliquot containing the γ-isomer.

72-0650. Kiermeier, F.; Nagy, M.; Stadelmann, W. (Milchwissenschaftlichen Institut der Techn. Universitaet Muenchen, Munich, Germany). **Zum enzymatischen Nachweis von Organophosphorinsecticiden. [On the enzymatic determination of organophosphate insecticides.]** *Z. Lebensm. Unters. Forsch. 146(3): 131-137; 1971.* (38 references) (German)

Two enzymatic methods (ΔpH-test and a colorimetric method) for the determination of organophosphate insecticides in plant materials are described. These insecticides inhibit cholinesterase which is the basis of both methods. No influence of the plant ingredient was found with the ΔpH test; however, using the colorimetric method, the susceptibility for disturbances, especially with cabbage, was strong due to the mustard oil. With the use of these two methods it is possible to detect organophosphate and carbamate insecticides in amounts of < 0.1 mg/kg plant material.

72-0651. Bohn, G.; Rucker, G. (Institut fuer Gerichtliche Medizin der Universitaet Muenster, v. Esmarchstrasse 86, 44 Muenster, Germany). **Zum massenspektrometrischen Nachweis geringer Mengen Parathion in Leichenmaterial nach duennschichtchromatographischer Trennung. [The mass spectrometric determination of small amounts of parathion in corpses after thin-layer chromatographic determination.]** *Beit. Gerichtl. Med. 27: 352-355; 1970.* (German)

Mass spectrometry can be used for the specific determination of pesticides. The mass spectrum can be used for identification of an unknown substance because the fragmentation process characteristic for a substance is dependent on its chemical nature. Chemical purity need not be as high as in IR spectroscopy and less sample is needed. Parathion was determined by combining thin-layer chromatography and mass spectrometry. A sample was isolated from stomach contents and liver and the parathion peak was found to have a mass/charge of 291. The fragmentation process used in mass spectrometry is the same as in IR spectroscopy. 20-25 mcg of parathion is the limiting concentration which can be determined by this process.

72-0652. Tetenyi, P.; Hethelyi, E.; Okuda, T.; Szilagyi, I. (Medicinal Plant Research Inst., Budapest, Hungary). **Use of programmed temperature in analytical determination of pyrethrins by electron capture detector.** *Pyrethrum Post 11(1): 29-31, 47; 1971.* (10 references)

The use of isothermal and programmed temperature methods for the qualitative and quantitative analyses of pyrethrin I and pyrethrin II by gas-liquid chromatography (GLC) are described. The relative error of the method is found to lie between 0.1 and 3.6 per cent. Tests were performed on refined Kenya extract, jasmolin I, and pyrethrum flowers. The total active material, based on the extraction isotherm, was recovered within a 2-hr extraction. The GLC analysis error on pyrethrins active material was 1.4-4.2%. The programmed temperature method was found to be better than the isothermal method.

72-0653. Verblyudova, N. I.; Klisenko, M. A. (Anal. Chem. Pesticides Lab. of the All-Union Scientific Research Inst. Hygiene and Toxicology of Pesticides, Polymers and Plastics, Kiev, USSR). **Opredeleniye v produktakh pitaniya polikhlorpinea v prisutstvii DDT i drugikh khlororganicheskikh pestitsidov. [Determination of polychloropinene in the presence of DDT and other organochlorine pesticides in foods.]** *Vop. Pitan. 29: 89-91; 1970.* (3 references) (Russian)

A method for the determination of polychloropinene in the presence of DDT and other organochlorine pesticides is presented. Purified *n*-hexane extract aliquots are applied on 6 × 6 cm silica gel chromatoplates activated at 140°C for 20 min. The granulation of silica gel should not exceed 3-10 μ. The carrier solvent system consists of *n*-hexane: methanol: ammonia 10: 40: 0.3 and is allowed to migrate 4-5 cm. The developing reagent consists of 0.5 g diphenylamine and 0.5 g zinc chloride in 100 ml acetone. After spraying, the plates are heated at 140°C for 10 min. Polychloropinene produces bluish-green spots, DDT and DDE produce red spots while DDD and heptachlor produce light blue and dark blue spots respectively. The sensitivity of the method for polychloropinene is of 2-3 μg amounts in the aliquot. Extraction procedures and application of the analytical method have been used for beet tops, potatoes and meat samples. A thin-layer chromatogram of standard solutions of the above organochlorine pesticides (2 μg aliquots) is reproduced.

72-0654. Gorbacheva, N. A. (Scientific Research Inst. Forensic Med., Ministry of Public Health of the USSR, Moscow, USSR). **Ispolzovaniye nekotorykh sorbentov pri sudebno-khimicheskom issledovanii metiletiltiofosa. Soobshcheniye I. [Application of certian sorbents in forensic chemical determinations of methyl ethyl thiophos. First communication.** *Sud. Med. Ekspert. 14: 38-43; 1971.* (Russian)

Sorption of methyl ethyl thiophos, (methyl ethyl parathion) p-nitrophenol and of an emulsifier OP-7 on several charcoal varieties, bentonites, silica gel and tripolite was investigated. Microcolumn chromatography was carried out with carrier solvents such as acetonitrile, methanol, ethanol, acetone, ethyl ether, chloroform, dichloroethane, benzene, toluene, hexane, heptane or petroleum ether. Chloroform, dichloroethane, benzene and

toluene elicited the best eluent properties toward methyl ethyl thiophos from all the charcoal sorbents. As opposed to methyl ethyl thiophos, *p*-nitrophenol was best adsorbed from these solvents by the same sorbents. The emulsifier was best retained by these charcoal varieties from hexane, heptane or petroleum ether carriers. Simultaneous adsorption of all 3 compounds can be expected from each of these three latter solvents while none would provide simultaneous elution of the three investigated species. The closeness of sorption and elution properties of certain compounds allows their simultaneous retention and elution from certain samples which can be utilized in forensic analysis.

72-0655. Snyder, D.; Reinert, R. (U.S. Fish and Wildlife Service, Great Lakes Fishery Lab., Ann Arbor, MI. 48107). **Rapid separation of polychlorinated biphenyls from DDT and its analogues on silica gel.** *Bull. Environ. Contam. Toxicol. 6(5): 385-390 1971.* (9 references)

Similarity in chemical characteristics of PCBs (polychlorinated biphenyls) cause these compounds to interfere with gas-liquid chromatographic analysis of certain chlorinated hydrocarbon insecticides. A rapid microanalytical procedure for separation of PCBs from DDT and its analogs (DDD, DDE) before analysis with GLC was devised. Commercial PCB preparations containing 54 and 60% chlorine (Arochlor 1254 and 1260) were rapidly and efficiently separated from DDT and its analogs using a silica gel column. PCBs were eluted with pentane and DDT and its analogs were eluted with benzene. Little prior preparation of the silica gel was needed. Because of the small size of the columns, numerous samples can be run simultaneously on individual columns in a small area. Separation is achieved in about 1 hour. The concentrations of the respective organochlorines were determined by gas-liquid chromatography. Reproducibility of results and quantitiative recoveries from samples were good.

72-0656. French, M. C.; Jefferies, D. J. (Monks Wood Experimental Station, Abbots Ripton, Huntingdonshire, England). **The preservation of biological tissue for organochlorine insecticide analysis.** *Bull Environ. Contam. Toxicol. 6(5): 460-463; 1971.* (4 references)

The collection and transport of biological specimens from remote areas to laboratories for pesticide analysis can be troublesome, especially when deep-freezing is impracticable. Therefore, the utility of phenol and formaldehyde as preservatives for organochlorine pesticide-containing tissues was examined. Two pigeons were fed 5 mg dieldrin and 10 mg *p,p'*-DDT per day for 5 days, then killed and the livers removed. The chopped livers were divided into ten portions, two of which were analyzed immediately. Four of the remaining specimens were placed in a 4% formaldehyde solution and four in 10% phenol. Livers and preservative were analyzed for dieldrin and DDT-derived compounds after 5 days, 10 days, 4 months and 1 year. A gradual tissue weight loss occurred in the formaldehyde; in phenol, the weight change was erratic. Organochlorines were not detectable in either preservative. Dieldrin contents in the tissues remained the same over the one-year period, as did the levels of DDT and its metabolites in phenol. In formaldehyde, the *p,p'*-DDT originally present was gradually converted to *p,p'*-TDE, only 10% of the original quantity of the former remaining after one year. This is presumably due to incomplete inhibition of bacterial activity. Formaldehyde was nevertheless designated as the preferred preservative, due to the predictability of weight loss; DDT breakdown can be accounted for.

72-0657. Mendoza, E. E. (Food and Drug Directorate, Dept. of National Health and Welfare, Ottawa, Ontario, Canada). **Note on the significant difference in gas-liquid chromatographic responses to insecticides injected at fast and slow rates.** *J. Chromatogr. Sci. 9(12): 753-754; 1971.* (6 references)

The effects of injection rates on the GLC response to Dyrene, aldrin, *p,p'*-DDT, malathion, and parathion (each at various concentrations) were studied using three electron capture detector foils. The effects of the detector temperature and nitrogen flow rate were also determined. GLC responses were significantly higher when Dyrene, aldrin, *p,p'*-DDT, malathion, and parathion were injected at a slow rate than when they were injected at a fast rate. Results were the same regardless of the pesticide concentrations, detector foils, and detector temperatures used.

72-0658. Leoni, V.; Puccetti, G. (Istituto d'Igiene dell'Universita di Roma, Rome, Italy). **Cromatografia su strato sottile di pesticidi organo-fosforici in rapporto a studi di contaminazione ambientale (acque superficiali italiane). [Thin-layer chromatography of organophosphorus pesticides applied to environmental contamination studies (Italian surface waters)].** *Farmaco Ed. Prat. 26: 383-393; 1971.* (41 references) (Italian)

Chromatographic data and threshold of detection of 23 organophosphate insecticides and their metabolites are reported. The use of thin-layer chromatography for the study of organophosphate pesticide residue analysis for investigation of contamination of major Italian river basins is described. The chemical and enzymatic detection of the various substances also permits evaluation of the "total anticholinesterase load" of the samples.

72-0659. Delvaux, E. L. (Inst. Sciences Economiques et Appliquees, U. of Louvain, Louvain, Belgium). **La detection des pesticides organochlores dans les lipides. [Detection of organochlorine pesticides in lipids.]** *J. Pharm. Belg. 26(5): 475-519; 1971.* (52 references) (French)

Procedures for the determination of organochlorine pesticides in fats and oils are reviewed. Included are the Mills, the Singh and Lanthier, and the Storherr methods. The Mills method constitutes a generally applicable screening method; the latter methods constitute suitable alternatives when saving of time and solvents is required. Special attention is given to solvent purification techniques, and problems arising from impurities such as peroxides, metabolites, and polychlorinated biphenyls are discussed. To prevent errors due to the technical quality of the pesticides, their photochemical degradation products, or reagent contamination, supplementary techniques to confirm the gas chromatographic data should be used. Thin-layer chromatography or combined gas chromatography and mass spectrometry should supplement the routine procedures. Detailed description of equipment, analytical techniques, and an updated bibliography are included.

See also **72-0451** **72-0466** **72-0470** **72-0473** **72-0476** **72-0477** **72-0479** **72-0487** **72-0491** **72-0492** **72-0500** **72-0502** **72-0515**

HAPAB QUARTERLY INDEX

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PREFACE

The basic design for this index was supplied by the Division of Pesticide Community Studies. It consists of two author indexes (personal and corporate) and two subject indexes (compound and concept).

Compounds are indexed by their common names; where other compound designations are used by authors, these synonyms appear with the notation to *see* the common name. Articles referring, in general, to structural or functional chemical classes are indexed under these broader headings (e.g., organochlorines, herbicides, etc.).

Subheadings in the compound index are identical with the main headings in the concept index, the latter having a maximum of three levels of specificity in addition to the compound.

Following is a cross-referenced guide to the subject headings:

Alternative Controls
Analysis
Antidotes (*see* Treatment of Poisoning)
Associations/Organizations
Beneficial Effects
Biochemical Effects (*see also* Enzyme Activity)
Blood/Body Fluids
Carcinogenesis
Cardiovascular System
Cholinesterase (*see* Enzyme Activity)
Cholinesterase-Measurement (*see* Analysis - Cholinesterase/Enzyme)
Chromatography (*see* Analysis - Chromatography)
Conferences
Cytological Effects
Decontamination (*see* Residue Removal)
Degradation (*see* Residue Degradation *and* Metabolism)
Dermal Effects (*see* Integument)
Diet (*see* Factors Influencing Metabolism/Toxicity - Nutritional State)
Digestive System
Domestic Animals (*see* Toxicity/Domestic Animals *and* Residues/Domestic Animals)
Economics
Education/Training (*see also* Prevention)
Embryology (*see* Reproduction/Growth - Embryo/Fetus)
Endrocrine System (*see also* Reproduction/Growth)
Environmental Pollution
Enzyme Activity (*see also* Biochemical Effects)
Excretory System
Experimental Animals (*see* Toxicity/Experimental Animals)
Experimental Design
Factors Influencing Metabolism/Toxicity
Food and Feed (*see* Residues/Food and Feed)
Human exposure (*see* Toxicity/Humans *and* Residues/Humans)
Immunology
Interactions (*see* Factors Influencing Metabolism/Toxicity)
Laws and Regulations (*see also* Prevention)
LD50 (*see* Toxicity/Experimental Animals)
Metabolism (*see also* Residue Degradation)
Microscopy, light and electron (*see* Cytology)
Morbidity and Mortality Statistics
Musculoskeletal System
Mutagenesis/Teratogenesis (*see also* Reproductive System)
Nervous System
Nomenclature
Photodecomposition (*see also* Residue Degradation)
Plants (*see* Residues/Plants)
Prevention (*see also* Laws and Regulations *and* Education/Training)
Reproduction/Growth (*see also* Endocrine System *and* Mutagenesis/Teratogenesis)
Residue Degradation (*see also* Photodecomposition *and* Metabolism
Residue Dynamics
Residue Removal
Residues/Air
Residues/Domestic Animals
Residues/Food and Feed
Residues/Human
Residues/Plants
Residues/Soil
Residue/Water
Residues/Wildlife
Respiratory System
Sensory System
Skeleton (*see* Musculoskeletal System)
Soil (*see* Residues/Soil)
Teratogenesis (*see* Mutagenesis/Teratogenesis)
Toxicity/Domestic Animals
Toxicity/Experimental Animals
Toxicity/Humans
Toxicity/Wildlife
Therapeutic Use
Treatment of Poisoning
Water (*see* Residues/Water)
Wildlife (*see* Residues/Wildlife)

Abate
Factors Influencing Metabolism/Toxicity
72-0117
Toxicity/Experimental Animals
72-0117
Toxicity/Wildlife
72-0334
Acetomitrile
see Methonyl derived compounds
O-2-Acetyl-6-methyl-pyrimidion-4-yl O,O-diethyl phosphorothioate
see Diazinon analogs and metabolites
Acrex
Analysis
72-0406
Acrylonitrile
see also Fumigants
Analysis
72-0647
Residue/Air
72-0647
Aldicarb
see also Carbamates
Analysis
72-0289 72-0463
Digestive System
72-0463
Enzyme activity
72-0369
Excretory System
72-0463
Factors Influencing Metabolism/Toxicity
72-0140
Metabolism
72-0140 72-0463
Musculoskeletal system
72-0463
Nervous System
72-0369
Residue Degradation
72-0140
Residues/Food and Feed
72-0463
Residues/Plants
72-0289
Sensory System
72-0369
Toxicity/Experimental Animals
72-0463
Toxicity/Wildlife
72-0369
Aldicarb derived compounds
see also Carbamates
Analysis
72-0463
Digestive System
72-0463
Excretory System
72-0463
Factors Influencing Metabolism/Toxicity
72-0140
Metabolism
72-0140 72-0463
Musculoskeletal system
72-0463
Residue Degradation
72-0140
Residues/Food and Feed
72-0463
Toxicity/Experimental Animals
72-0463
Aldrin
Analysis
72-0036 72-0175
72-0218 72-0249
72-0256 72-0262
72-0263 72-0269
72-0303 72-0352
72-0390 72-0402
72-0408 72-0410
72-0451 72-0477
72-0631 72-0657
Cytological effects
72-0376 72-0614
Endocrine system
72-0197
Environmental Pollution
72-0240
Enzyme activity
72-0083 72-0376
72-0614
Excretory System
72-0376
Factors Influencing Metabolism/Toxicity
72-0083 72-0197
Integument
72-0199
Laws and Regulations
72-0060 72-0072
72-0243 72-0244
72-0437
Metabolism
72-0175 72-0198
Musculoskeletal system
72-0376
Nervous System
72-0199 72-0376
Prevention
72-0244
Reproduction/Growth
72-0064 72-0197
72-0198 72-0347
Residue Degradation
72-0065 72-0072
72-0073 72-0249
72-0293
Residue Dynamics
72-0064 72-0074
Residue Removal
72-0475
Residues/Food and Feed
72-0036 72-0060
72-0072 72-0240
72-0243 72-0256
72-0313 72-0410
72-0450 72-0451
72-0475 72-0477
Residues/Humans
72-0083 72-0240
72-0451
Residues/Plants
72-0064 72-0072
72-0410
Residues/Soil
72-0065 72-0072
72-0073 72-0074
72-0240 72-0249
72-0256 72-0262
72-0263 72-0303
72-0410
Residues/Water
72-0062 72-0243
Residues/Wildlife
72-0062 72-0064
72-0175 72-0198
72-0199
Toxicity/Domestic Animals
72-0197 72-0244
Toxicity/Experimental Animals
72-0240 72-0437
Toxicity/Humans
72-0083 72-0240
72-0243 72-0244
Toxicity/Wildlife
72-0175 72-0198
72-0199 72-0240
72-0243 72-0244
72-0376 72-0352
Aldrin derived compounds
see also Dieldrin
Analysis
72-0225

Reproduction/Growth
72-0347
Allethrin
see also Botanicals
Analysis
72-0149 72-0224
Metabolism
72-0149
Nervous System
72-0148
Toxicity/Experimental Animals
72-0148
Allethrin derived compounds
Analysis
72-0224
Alvitt 55
see Dieldrin
Ametryne
see also Herbicides
Analysis
72-0079
Residue Dynamics
72-0079
Residues/Soil
72-0079
Aniben
Analysis
72-0398
Residues/Soil
72-0398
Aminocarb
see also Carbamates
Analysis
72-0601
Blood/Body fluids
72-0601
Enzyme activity
72-0601
Laws and Regulations
72-0243
Residues/Food and Feed
72-0243
Residues/Water
72-0243
Toxicity/Experimental Animals
72-0601
Toxicity/Humans
72-0243
Toxicity/Wildlife
72-0243
m-Aminophenol
see Phenmediphan derived compounds
Aminotriazole
see Amitrole
4-Amino-3,5,6-trichloropicolinic acid
see Picloram
Aminozide
Analysis
72-0209
Residues/Food and Feed
72-0209
Residues/Plants
72-0209
Amitrole
see also Herbicides
Analysis
72-0354 72-0632
Metabolism
72-0354
Residues/Plants
72-0354
6-ANBP
see Dinobuton derived compounds
Antidotes
see also Pralidoxime
Arochlor
Cardiovascular system
72-0353
Cytological effects
72-0353
Enzyme activity
72-0353
Toxicity/Domestic Animals
72-0353
Arsenicals
see also Herbicides, MSMA
Environmental Pollution
72-0424
Factors Influencing Metabolism/Toxicity
72-0332
Laws and Regulations
72-0424
Morbidity and Mortality Statistics
72-0607
Nervous System
72-0332
Residue Dynamics
72-0323
Residues/Water
72-0323
Toxicity/Experimental Animals
72-0607
Toxicity/Humans
72-0323 72-0332
72-0607
Treatment of Poisoning
72-0607
Atrazine
see also Herbicides
Analysis
72-0069 72-0249
72-0392 72-0398
72-0399 72-0468
Factors Influencing Metabolism/Toxicity
72-0069
Metabolism
72-0069 72-0563
Prevention
72-0333
Residue Degradation
72-0049 72-0249
72-0294
Residue Dynamics
72-0049 72-0053
Residues/Food and Feed
72-0069
Residues/Soil
72-0049 72-0053
72-0249 72-0398
72-0399 72-0468
72-0563
Residues/Water
72-0286 72-0446
72-0563
Attractants
see also Methyl eugenol
Azinphosethyl
Alternative controls
72-0469
Laws and Regulations
72-0243
Prevention
72-0469
Residues/Food and Feed
72-0243 72-0469
Residues/Water
72-0243
Toxicity/Humans
72-0243
Toxicity/Wildlife
72-0243
Azinphosmethyl
see also Organophosphates
Analysis
72-0215 72-0230
72-0376
72-0410
Digestive System
72-0215
Enzyme activity
72-0369 72-0376
Factors Influencing Metabolism/Toxicity
72-0606

Laws and Regulations
72-0243
Metabolism
72-0215 72-0606
Nervous System
72-0230 72-0369
Residues/Food and Feed
72-0243 72-0410
Residues/Plants
72-0410
Residues/Soil
72-0398 72-0410
Residues/Water
72-0243
Sensory System
72-0369
Toxicity/Experimental Animals
72-0215 72-0376 72-0606
Toxicity/Humans
72-0243
Toxicity/Wildlife
72-0230 72-0243 72-0369

Aziridine
Analysis
72-0223

Azodrin
see Monocrotophos

Banol
see also Carbamates
Analysis
72-0357 72-0601
Blood/Body fluids
72-0601
Enzyme activity
72-0108 72-0601
Factors Influencing Metabolism/Toxicity
72-0108
Metabolism
72-0357
Nervous System
72-0108
Respiratory System
72-0357
Toxicity/Experimental Animals
72-0108 72-0601

BAS 3191
Analysis
72-0460
Metabolism
Microorganisms
72-0460

Baycid
see Fenthion

Bayer-78418
see Hinosan

Baygon
see Propoxur

Baytex
see Fenthion

Benlate
see Benomyl

Benomyl
see also Fungicides
Analysis
72-0394
Residue Degradation
72-0073
Residues/Soil
72-0073
Spectrometry
72-0394

BHC
see also Organochlorines
Analysis
72-0213 72-0302 72-0365 72-0390 72-0403 72-0404 72-0408 72-0410 72-0421 72-0451 72-0557 72-0649
Beneficial Effects
72-0439
Blood/body fluids
72-0365 72-0557
Cytological Effects
72-0614
Environmental Pollution
72-0240 72-0439
Enzyme Activity
72-0614
Experimental Design
72-0439
Factors Influencing Metabolism/Toxicity
72-0340 72-0441
Laws and Regulations
72-0031 72-0437 72-0439 72-0441
Metabolism
72-0031 72-0340 72-0441
Morbidity and Mortality Statistics
72-0441
Reproduction/Growth
72-0557
Residue Degradation
72-0441
Residue/Air
72-0213
Residues/Domestic Animals
72-0031
Residues/Food and Feed
72-0031 72-0240 72-0304 72-0410 72-0441 72-0450 72-0451
Residues/Humans
72-0031 72-0240 72-0441 72-0451 72-0557
Residues/Plants
72-0276 72-0304 72-0410 72-0473
Residues/Soil
72-0240 72-0302 72-0304 72-0410
Residues/Water
72-0304
Toxicity/Experimental Animals
72-0240 72-0340 72-0437
Toxicity/Humans
72-0240 72-0441 72-0557
Toxicity/Wildlife
72-0240

beta-BHC
see BHC

gamma-BHC
see Lindane

BHC isomers
see also Organochlorines
Analysis
72-0473

Bidrin
see Dicrotophos

Bispyridinium compounds
see also HS 6, HS 8, Obidoxime, PM2OP, PM3P, TMB4

Blasticidan-S
Prevention
72-0517
Sensory System
72-0517
Toxicity/Humans
72-0517

Bordeaux mixture
see also Fungicides
Biochemical effects
72-0568
Blood/Body fluids
72-0568
Excretory System
72-0568

Toxicity/Experimental Animals
72-0568
Toxicity/Humans
72-0568
Botanicals
see also Allethrin, Pyrethrins
Bromacil
see also Herbicides
Prevention
72-0333
Residue Degradation
72-0294
Residue Dynamics
72-0067
Residues/Soil
72-0067
Bromides
Analysis
72-0036
Residues/Food and Feed
72-0036
Bromophos
Laws and Regulations
72-0243
Nervous System
72-0372
Residues/Food and Feed
72-0243
Residues/Water
72-0243
Toxicity/Domestic Animals
72-0453
Toxicity/Experimental Animals
72-0372
Toxicity/Humans
72-0243
Toxicity/Wildlife
72-0243
Bromopropylate
Cytological effects
72-0174
Digestive System
72-0174
Enzyme activity
72-0174
Metabolism
72-0174
BTDU
Enzyme activity
72-0362
Metabolism
72-0362
Therapeutic use
72-0362
Toxicity/Experimental Animals
72-0362
Butacarb
see also Carbamates
Metabolism
72-0560
Toxicity/Experimental Animals
72-0560
Butonate
see also Organophosphates
Analysis
72-0476
Residues/Food and Feed
72-0476
Toxicity/Domestic Animals
72-0453
n-Butyl ester 2,4-D
see 2,4-D esters
n-Butyl ester 2,4,5-T
see 2,4,5-T esters
Butylate
Analysis
72-0388
Residues/Food and Feed
72-0388
n-tert-Butylphenyl-N-methylcarbamate
see Chevron
Bux
Analysis
72-0601
Blood/Body fluids
72-0601
Enzyme activity
72-0601
Factors Influencing Metabolism/Toxicity
72-0140
Metabolism
72-0140
Residue Degradation
72-0140
Toxicity/Experimental Animals
72-0601
Bux derived compounds
see also Carbamates
Factors Influencing Metabolism/Toxicity
72-0140
Metabolism
72-0140
Residue Degradation
72-0140
Calixin
see Tridemorph
Captan
see also Fungicides
Analysis
72-0408 72-0421
Residue Degradation
72-0073
Residues/Soil
72-0073
Spectrometry
72-0408
Carbamates
see also , Aldicarb, Aldicarb derived compounds, Aminocarb, Banol, Butacarb, Bux derived compounds, Carbanolate, Carbaryl, Carbaryl derived compounds, Carbofuran, Carbofuran derived compounds, Cartap derived compounds, Chevron, Dimetan, Dimetilan, Ethyl N-(3-chloro-4-methoxyphenyl) carbamate, Formetanate, GS-15171, Isolane, Landrin, Meobal, Meobal derived compounds, Mesurol, Metham, Methomyl , Methomyl derived compounds, Moban, MPMC, MTMC, Promecarb, Propoxur , Propoxur derived compounds, Pyrolan, Triallate, Zectran, 1-Naphthyldimethylcarbamate
Alternative controls
72-0242
Analysis
72-0650
Blood/Body fluids
72-0121 72-0343
Enzyme activity
72-0121 72-0136
72-0139 72-0343
Experimental Design
72-0142 72-0343
Factors Influencing Metabolism/Toxicity
72-0121 72-0139
72-0142
Metabolism
72-0055 72-0142
72-0452
Residue Degradation
72-0055

Residues/Food and Feed
72-0055 72-0452
Residues/Plants
72-0650
Toxicity/Experimental Animals
72-0139 72-0142
Toxicity/Humans
72-0095
Treatment of Poisoning
72-0095

Carbanolate
see also Carbamates
Toxicity/Experimental Animals
72-0144

Carbaryl
see also Carbamates
Alternative controls
72-0242 72-0469
Analysis
72-0036 72-0249
72-0342 72-0354
72-0355 72-0357
72-0456 72-0503
72-0594 72-0601
72-0648
Biochemical effects
72-0205
Blood/Body fluids
72-0601
Cytological effects
72-0202
Digestive System
72-0129 72-0342
Endocrine system
72-0179
Enzyme activity
72-0369 72-0585
72-0601
Factors Influencing Metabolism/Toxicity
72-0140
Integument
72-0187
Laws and Regulations
72-0243
Metabolism
72-0129 72-0140
72-0342 72-0354
72-0355 72-0357
72-0456
Musculoskeletal system
72-0116
Nervous System
72-0187 72-0369
72-0585
Prevention
72-0333 72-0469
Reproduction/Growth
72-0179 72-0205
Residue Degradation
72-0073 72-0140
72-0249 72-0294
72-0456
Residues/Food and Feed
72-0036 72-0243
72-0469
Residues/Plants
72-0354 72-0355
Residues/Soil
72-0073 72-0249
72-0503
Residues/Water
72-0243 72-0456
Respiratory System
72-0357
Sensory System
72-0187 72-0369
Toxicity/Experimental Animals
72-0116 72-0129
72-0144 72-0179
72-0342 72-0594
72-0601
Toxicity/Humans
72-0243 72-0585
Toxicity/Wildlife
72-0187 72-0243
72-0369

Carbaryl derived compounds
see also Carbamates
Analysis
72-0154
Biochemical effects
72-0154
Cytological effects
72-0154
Digestive System
72-0129 72-0154
Enzyme activity
72-0154
Factors Influencing Metabolism/Toxicity
72-0140
Metabolism
72-0129 72-0140
72-0154
Reproduction/Growth
72-0154
Residue Degradation
72-0140
Toxicity/Experimental Animals
72-0129 72-0144

Carbofuran
see also Carbamates
Analysis
72-0354 72-0386
Enzyme activity
72-0369
Factors Influencing Metabolism/Toxicity
72-0140
Metabolism
72-0140 72-0354
Nervous System
72-0369
Residue Degradation
72-0140
Residues/Food and Feed
72-0386
Residues/Plants
72-0354 72-0386
Residues/Soil
72-0386
Sensory System
72-0369
Toxicity/Wildlife
72-0369

Carbofuran derived compounds
see also Carbamates
Factors Influencing Metabolism/Toxicity
72-0140
Metabolism
72-0140
Residue Degradation
72-0140

Carbon disulfide
see also Fumigants
Analysis
72-0647
Residue/Air
72-0647

Carbon tetrachloride
see also Fumigants
Analysis
72-0647
Cytological effects
72-0584
Digestive System
72-0584
Factors Influencing Metabolism/Toxicity
72-0584
Metabolism
72-0584
Residue/Air
72-0647
Toxicity/Experimental Animals
72-0584

Carbophenothion
Laws and Regulations
72-0243
Residues/Food and Feed
72-0243
Residues/Water
72-0243
Toxicity/Humans
72-0243
Toxicity/Wildlife
72-0243
Carboxide
Integument
72-0158
Metabolism
72-0158
Prevention
72-0158
Toxicity/Humans
72-0158
Carboxin
Biochemical effects
72-0125
Cytological effects
72-0125 72-0379
Digestive System
72-0125 72-0379
Enzyme activity
72-0125
Toxicity/Experimental Animals
72-0379
Carboxin derived compounds
see also Fungicides
Biochemical effects
72-0125
Cytological effects
72-0125
Digestive System
72-0125
Enzyme activity
72-0125
1-(Carboxyethyl)-ethyl-3-methyl-5-(N,N-dimethylcarbamyloxy)pyrazo
see GS-15171
Cartap derived compounds
see also Carbamates
Musculoskeletal System
72-0124
Nervous System
72-0124
Toxicity/Experimental Animals
72-0124
CCC
see Chlormequat chloride
Chevron
see also Carbamates
Analysis
72-0559
Enzyme activity
72-0559
Toxicity/Experimental Animals
72-0559
Chloramben
Analysis
72-0354
Metabolism
72-0354
Residues/Plants
72-0354
Chlordane
Analysis
72-0249 72-0269
72-0302 72-0408
72-0410 72-0461
72-0623
Blood/Body fluids
72-0542 72-0554
Carcinogenesis
72-0171 72-0288
Cytological effects
72-0376 72-0614
Enzyme activity
72-0376 72-0542
72-0614
Excretory System
72-0376
Factors Influencing Metabolism/Toxicity
72-0171 72-0542
Laws and Regulations
72-0072
Musculoskeletal system
72-0116 72-0376
Nervous System
72-0376 72-0542
Residue Degradation
72-0072 72-0249
Residue Removal
72-0475
Residue/Air
72-0288
Residues/Domestic Animals
72-0299
Residues/Food and Feed
72-0072 72-0299
72-0313 72-0410
72-0475
Residues/Humans
72-0554
Residues/Plants
72-0072 72-0299
72-0410 72-0461
Residues/Soil
72-0072 72-0249
72-0299 72-0302
72-0410 72-0461
Residues/Water
72-0062
Residues/Wildlife
72-0062
Respiratory System
72-0171
Therapeutic use
72-0171 72-0542
Toxicity/Experimental Animals
72-0116 72-0171
72-0542
Toxicity/Humans
72-0554
Toxicity/Wildlife
72-0376
gamma-Chlordane
Analysis
72-0262 72-0263
Residues/Soil
72-0262 72-0263
Chlorfenvinphos
see also Organophosphates
Analysis
72-0113 72-0354
Digestive System
72-0113
Enzyme activity
72-0165
Excretory System
72-0113
Factors Influencing Metabolism/Toxicity
72-0113 72-0165
Laws and Regulations
72-0243
Metabolism
72-0354
Nervous System
72-0113 72-0165
Residues/Food and Feed
72-0048 72-0243
Residues/Plants
72-0354
Residues/Water
72-0243
Toxicity/Experimental Animals
72-0113 72-0165
Toxicity/Humans
72-0243
Toxicity/Wildlife
72-0243
Chlormequat chloride
see also Herbicides

Analysis
72-0185
Digestive System
72-0185
Enzyme activity
72-0185
Factors Influencing Metabolism/Toxicity
72-0185
Metabolism
72-0185
Nervous System
72-0185
Chlorobenzilate
see also Organochlorines
Analysis
72-0470
Cytological effects
72-0174
Digestive System
72-0174
Enzyme activity
72-0174
Metabolism
72-0174 72-0470
Residues/Food and Feed
72-0470
Toxicity/Domestic Animals
72-0470
Toxicity/Experimental Animals
72-0470
Toxicity/Wildlife
72-0470
Chlorocholine chloride
see Chlormequat chloride
Chlorodibenzo-p-dioxin
Prevention
72-0092
Residue Degradation
72-0092
Toxicity/Humans
72-0092
2-Chloro-1-(2,4-dichlorophenyl) vinyl ethyl ethylphosphonate
see WL-22864
Chlorofos
see Trichlorfon
3-Chloro-4-methoxyacetanilide
Residue Degradation
72-0045
Residues/Soil
72-0045
3-Chloro-4-methoxyaniline
Residue Degradation
72-0045
Residues/Soil
72-0045
N'-(3-Chloro-4-methoxyphenyl)-N,N-dimethylurea
see Metoxuron
4-Chloro-2-methylphenoxyacetic acid
see MCPB
p-Chlorophenyl N-methylcarbamate
see also Herbicides
Analysis
72-0581
Enzyme activity
72-0581
Metabolism
72-0581
Residue Degradation
72-0581
Toxicity/Experimental Animals
72-0581
Chlorophos
see Trichlorfon
Chloropicrin
see also Fumigants
Analysis
72-0226 72-0647
Residue/Air
72-0647
Residues/Food and Feed
72-0226
Chloropropham
Analysis
72-0399
Residues/Soil
72-0399
Chloropropylate
see also Organochlorines
Analysis
72-0470
Cytological effects
72-0174
Digestive System
72-0174
Enzyme activity
72-0174
Metabolism
72-0174 72-0470
Residues/Food and Feed
72-0470
Toxicity/Domestic Animals
72-0470
Toxicity/Experimental Animals
72-0470
Toxicity/Wildlife
72-0470
Chlorothalonil
see also Fungicide
Factors Influencing Metabolism/Toxicity
72-0159
Toxicity/Experimental Animals
72-0159
Chloroxuron
Analysis
72-0387
6-Chloro-3,4-xylyl methylcarbamate
see Banol
Chlorpropham
see also Herbicides
Analysis
72-0354 72-0355
72-0388
Metabolism
72-0354 72-0355
Residue Degradation
72-0049
Residue Dynamics
72-0049
Residues/Food and Feed
72-0388
Residues/Plants
72-0354 72-0355
Residues/Soil
72-0049
Chlorthiamid
see also Herbicide
Residue Dynamics
72-0070
Residues/Soil
72-0070
Cinerins
see Pyrethrins
Ciodrin
see Crotoxyphos
Clophen A50
see Polychlorinated biphenyls
Co-Ral
see Coumaphos
Compound 1080
see Sodium fluoroacetate
Conen
see also Fungicide
Analysis
72-0210
Residues/Food and Feed
72-0210
Copper oxychloride
Metabolism
72-0563

Residues/Soil
72-0563
Residues/Water
72-0563
Copper sulfate
see also Fungicides
Biochemical effects
72-0568
Blood/Body fluids
72-0568
Excretory System
72-0568
Toxicity/Experimental Animals
72-0568
Toxicity/Humans
72-0568
Cotnion
see Azinphosmethyl
Coumaphos
see also Organophosphates
Analysis
72-0376
Digestive System
72-0349
Enzyme activity
72-0349 72-0376
Toxicity/Experimental Animals
72-0349 72-0376
Coumatetralyl
see also Rodenticides
Toxicity/Domestic Animals
72-0429
Toxicity/Experimental Animals
72-0429
Toxicity/Humans
72-0429
Crotoxyphos
see also Organophosphates
Analysis
72-0080
Enzyme activity
72-0165
Factors Influencing Metabolism/Toxicity
72-0165
Nervous System
72-0165
Residues/Food and Feed
72-0080
Toxicity/Experimental Animals
72-0165
Crufomate
see also Organophosphates
Digestive System
72-0349
Enzyme activity
72-0349
Toxicity/Experimental Animals
72-0349
CT-42
see Dodine
see Thiram
Cycloate
Analysis
72-0317 72-0388
Residues/Food and Feed
72-0317 72-0388
Residues/Plants
72-0317

1,3-D
Residue Degradation
72-0292
Residues/Soil
72-0292
2,4-D
see also Herbicides
Alternative controls
72-0238
Analysis
72-0249 72-0275
72-0380 72-0398
72-0399 72-0400
72-0412 72-0417
72-0630
Benefical Effects
72-0016
Beneficial Effects
72-0001
Carcinogenesis
72-0118 72-0238
Digestive System
72-0602
Enzyme activity
72-0083
Factors Influencing Metabolism/Toxicity
72-0083 72-0345
72-0602
Laws and Regulations
72-0238 72-0345
Metabolism
72-0042
Musculoskeletal system
72-0345
Mutagenesis/ Teratogenesis
72-0345
Nervous System
72-0522 72-0602
Prevention
72-0016 72-0092
72-0333 72-0602
Reproduction/Growth
72-0118
Residue Degradation
72-0049 72-0092
72-0249 72-0294
Residue Dynamics
72-0016 72-0042
72-0049
Residue/Plants
72-0016
Residue/Water
72-0094
Residues/Food and Feed
72-0275
Residues/Human
72-0083
Residues/Plants
72-0042
Residues/Soil
72-0049 72-0249
72-0398 72-0399
72-0400
Residues/Water
72-0238 72-0446
Residues/Wildlife
72-0094
Toxicity/Domestic Animals
72-0602
Toxicity/Experimental Animals
72-0118 72-0238
72-0345
Toxicity/Humans
72-0083 72-0092
72-0522
Toxicity/Wildlife
72-0094
2,4-D derived compounds
see also Herbicides
Metabolism
72-0042
Residue Dynamics
72-0042
Residues/Plants
72-0042
2,4-D esters
see also Herbicides
Analysis
72-0477
Residues/Food and Feed
72-0477
DABP
see Dinobuton derived compounds
Daconil
see Chlorothalonil
Dacthal
Analysis
72-0390

Dalapon
Prevention
72-0333
Residue Degradation
72-0294
Residues/Soil
72-0290
Residues/Water
72-0290
Dalapon-Na
see also Herbicides
Biochemical effects
72-0127
Cytological effects
72-0127
Digestive System
72-0127
Toxicity/Experimental Animals
72-0127
Danifos
see also Organophosphates
Factors Influencing Metabolism/Toxicity
72-0159
Toxicity/Experimental Animals
72-0159
Dasanit
see also Organophosphates
Analysis
72-0376
Enzyme activity
72-0376
Toxicity/Experimental Animals
72-0376
2,4-DB
Analysis
72-0354 72-0380
Metabolism
72-0354
Residues/Plants
72-0354
DBCP
Residue Degradation
72-0292 72-0294
Residues/Soil
72-0292
DCDD
Residues/Food and Feed
72-0273
Residues/Plants
72-0273
Residues/Soil
72-0273
DCP
Analysis
72-0310
Residues/Food and Feed
72-0273
Residues/Plants
72-0273
Residues/Soil
72-0273
D-D
see also Fumigants, Nematocides
Analysis
72-0383 72-0583
Digestive System
72-0583
Excretory System
72-0583
Metabolism
72-0583
Residues/Food and Feed
72-0383
Respiratory System
72-0583
DDA
see DDT derived compounds
Analysis
72-0421
DDD
see TDE
o,p'-DDD
see TDE
DDE
see DDT derived compounds
p,p'-DDE
see DDT derived compounds
DDMU
see DDT derived compounds
DDT
see also Organochlorines
Alternative controls
72-0242 72-0433
Analysis
72-0036 72-0150
72-0161 72-0175
72-0191 72-0213
72-0218 72-0249
72-0258 72-0256
72-0258 72-0259
72-0260 72-0261
72-0262 72-0263
72-0264 72-0265
72-0266 72-0268
72-0269 72-0278
72-0279 72-0281
72-0296 72-0300
72-0302 72-0303
72-0307 72-0339
72-0365 72-0390
72-0402 72-0403
72-0404 72-0408
72-0410 72-0412
72-0421 72-0451
72-0459 72-0465
72-0467 72-0474
72-0478 72-0482
72-0485 72-0557
72-0578 72-0591
72-0599 72-0630
72-0636 72-0638
72-0653 72-0655
72-0657
Associations/ Organizations
72-0247 72-0423
Beneficial Effects
72-0004 72-0013
72-0015 72-0443
72-0439
Biochemical effects
72-0031 72-0161
72-0169 72-0205
72-0350 72-0436
72-0459 72-0595
72-0621
Blood/Body fluids
72-0365 72-0533
72-0554 72-0557
72-0578
Carcinogenesis
72-0132 72-0252
72-0567
Cardiovascular system
72-0365 72-0459
Cytological effects
72-0186 72-0202
72-0339 72-0363
72-0376 72-0506
72-0584 72-0603
Digestive System
72-0044 72-0135
72-0153 72-0169
72-0186 72-0191
72-0278 72-0308
72-0339 72-0370
72-0432 72-0448
72-0459 72-0482
72-0506 72-0578
72-0584 72-0621
Endocrine system
72-0169 72-0595
Environmental Pollution
72-0004 72-0014
72-0240 72-0241
72-0246 72-0252
72-0432 72-0433
72-0436 72-0439

Enzyme activity
72-0031 72-0133
72-0135 72-0151
72-0153 72-0186
72-0339 72-0350
72-0362 72-0376
72-0432 72-0443
72-0506 72-0562
72-0576 72-0595
72-0603 72-0621
Excretory System
72-0281 72-0370
72-0376 72-0459
72-0562 72-0603
Experimental Design
72-0150 72-0439
Factors Influencing Metabolism/Toxicity
72-0044 72-0132
72-0133 72-0135
72-0151 72-0170
72-0186 72-0320
72-0340 72-0346
72-0350 72-0436
72-0441 72-0457
72-0578 72-0584
72-0591 72-0604
72-0636
Immunology
72-0546
Integument
72-0459
Laws and Regulations
72-0060 72-0072
72-0237 72-0243
72-0244 72-0247
72-0423 72-0432
72-0433 72-0437
72-0438 72-0439
72-0441
Metabolism
72-0041 72-0044
72-0150 72-0151
72-0170 72-0175
72-0190 72-0191
72-0192 72-0198
72-0340 72-0350
72-0362 72-0374
72-0436 72-0441
72-0457 72-0563
72-0576 72-0578
72-0584 72-0591
Morbidity and Mortality Statistics
72-0086 72-0441
Musculoskeletal system
72-0116 72-0278
72-0376 72-0459
72-0546
Mutagenesis/Teratogenesis
72-0433
Nervous System
72-0169 72-0308
72-0376 72-0459
72-0522 72-0603
72-0604
Photodecomposition
72-0432
Prevention
72-0244 72-0333
72-0481 72-0509
72-0517 72-0534
Reproduction/Growth
72-0031 72-0100
72-0114 72-0163
72-0198 72-0205
72-0308 72-0312
72-0320 72-0363
72-0436 72-0533
72-0557 72-0591
72-0599
Residue Degradation
72-0072 72-0073
72-0151 72-0192
72-0246 72-0249
72-0293 72-0294
72-0300 72-0441
72-0457 72-0485
72-0578 72-0591
Residue Dynamics
72-0478 72-0481
Residue Removal
72-0246 72-0283
72-0474 72-0475
72-0485
Residue/Air
72-0213 72-0246
72-0478
Residues/Domestic Animals
72-0041 72-0281
72-0433 72-0459
Residues/Food and Feed
72-0036 72-0060
72-0072 72-0240
72-0243 72-0246
72-0252 72-0256
72-0264 72-0279
72-0281 72-0283
72-0284 72-0410
72-0432 72-0433
72-0441 72-0448
72-0450 72-0451
72-0475 72-0481
72-0653
Residues/Humans
72-0031 72-0086
72-0240 72-0246
72-0283 72-0423
72-0432 72-0436
72-0441 72-0448
72-0451 72-0554
72-0557
Residues/Plants
72-0072 72-0132
72-0264 72-0410
72-0467 72-0474
72-0481 72-0509
72-0546
Residues/Soil
72-0072 72-0073
72-0240 72-0246
72-0249 72-0256
72-0260 72-0261
72-0262 72-0263
72-0264 72-0296
72-0302 72-0303
72-0410 72-0457
72-0483 72-0563
Residues/Water
72-0014 72-0062
72-0243 72-0246
72-0252 72-0266
72-0268 72-0287
72-0432 72-0455
72-0465 72-0467
72-0563 72-0577
Residues/Wildlife
72-0044 72-0062
72-0175 72-0198
72-0246 72-0255
72-0258 72-0259
72-0260 72-0261
72-0265 72-0266
72-0307 72-0308
72-0312 72-0432
72-0433 72-0455
72-0467 72-0482
72-0577
Respiratory System
72-0153 72-0346
72-0546 72-0603
Sensory System
72-0517 72-0604
Therapeutic use
72-0339 72-0362
72-0423 72-0621
Toxicity/Domestic Animals
72-0244 72-0246
72-0374 72-0448
72-0459
Toxicity/Experimental Animals
72-0116 72-0132
72-0133 72-0135

72-0150 72-0163
72-0169 72-0170
72-0186 72-0190
72-0191 72-0192
72-0240 72-0339
72-0340 72-0346
72-0350 72-0362
72-0363 72-0437
72-0448 72-0567
72-0577 72-0584
72-0595 72-0604
Toxicity/Humans
72-0086 72-0237
72-0240 72-0243
72-0244 72-0246
72-0247 72-0252
72-0423 72-0441
72-0506 72-0509
72-0517 72-0522
72-0533 72-0546
72-0554 72-0557
Toxicity/Wildlife
72-0013 72-0100
72-0153 72-0175
72-0186 72-0198
72-0237 72-0240
72-0241 72-0243
72-0244 72-0246
72-0252 72-0278
72-0320 72-0370
72-0376 72-0423
72-0562 72-0577
72-0599 72-0603
Treatment of Poisoning
72-0546

p,p'-DDT
see DDT

DDT derived compounds
see also Organochlorines
Analysis
72-0063 72-0150
72-0175 72-0206
72-0218 72-0249
72-025M 72-0256
72-0258 72-0259
72-0260 72-0261
72-0262 72-0264
72-0265 72-0266
72-0268 72-0279
72-0302 72-0303
72-0329 72-0351
72-0365 72-0390
72-0402 72-0403
72-0421 72-0465
72-0474 72-0477
72-0478 72-0482
72-0557 72-0578
72-0599 72-0632
72-0638 72-0653
72-0655 72-0656
Biochemical effects
72-0169 72-0206
72-0338 72-0350
72-0595
Blood/Body fluids
72-0365 72-0449
72-0533 72-0557
72-0578
Carcinogenesis
72-0132
Cardiovascular system
72-0365
Cytological effects
72-0338
Digestive System
72-0169 72-0308
72-0482 72-0448
72-0578
Endocrine system
72-0169 72-0595
Enzyme activity
72-0151 72-0338
72-0350 72-0576
72-0595
Experimental Design
72-0150
Factors Influencing Metabolism/Toxicity
72-0132 72-0151
72-0170 72-0350
72-0457 72-0578
72-0613 72-0615
Immunology
72-0613
Metabolism
72-0041 72-0063
72-0150 72-0151
72-0170 72-0175
72-0192 72-0198
72-0350 72-0374
72-0457 72-0576
72-0578 72-0596
72-0615
Nervous System
72-0169 72-0308
Reproduction/Growth
72-0114 72-0198
72-0206 72-0308
72-0329 72-0351
72-0533 72-0557
72-0599
Residue Degradation
72-0151 72-0192
72-0249 72-0457
72-0578 72-0656
Residue Dynamics
72-0478
Residues/Food and Feed
72-0448
Residues/Humans
72-0448
Residue Removal
72-0283 72-0474
72-0475
Residue/Air
72-0478
Residues/Domestic Animals
72-0041
Residues/Food and Feed
72-0256 72-0264
72-0279 72-0283
72-0475 72-0477
72-0596 72-0653
Residues/Humans
72-0283 72-0326
72-0557
Residues/Plants
72-0063 72-0132
72-0264 72-0474
Residues/Soil
72-0249 72-0256
72-0260 72-0261
72-0262 72-0264
72-0302 72-0303
72-0457
Residues/Water
72-0062 72-0063
72-0266 72-0268
72-0455 72-0465
Residues/Wildlife
72-0062 72-0175
72-0198 72-025M
72-0258 72-0259
72-0260 72-0261
72-0265 72-0266
72-0308 72-0329
72-0455 72-0482
72-0615
Toxicity/Domestic Animals
72-0374 72-0448
Toxicity/Experimental Animals
72-0132 72-0150
72-0169 72-0170
72-0192 72-0206
72-0338 72-0350
72-0448 72-0595
Toxicity/Humans
72-0449 72-0533
72-0557
Toxicity/Wildlife
72-0175 72-0198
72-0206 72-0329
72-0599

Treatment of Poisoning
72-0326 72-0615
DDT isomers
see also Organochlorines
Analysis
72-0150 72-0152
72-0261 72-0266
72-0279 72-0302
72-0303 72-0365
72-0390 72-0473
72-0477
Biochemical effects
72-0169 72-0338
72-0595
Blood/body fluids
72-0365
Carcinogenesis
72-0132
Cardiovascular system
72-0365
Cytological effects
72-0338 72-0376
Digestive System
72-0044 72-0169
Endocrine system
72-0169 72-0595
Enzyme activity
72-0338 72-0376
72-0595
Excretory System
72-0376
Experimental Design
72-0150
Factors Influencing
Metabolism/Toxicity
72-0044 72-0132
72-0613
Immunology
72-0613
Metabolism
72-0044 72-0150
72-0152 72-0177
72-0596 72-0616
Musculoskeletal system
72-0376
Nervous System
72-0169 72-0376
72-0612
Reproduction/Growth
72-0612 72-0616
Residues/Food and Feed
72-0279 72-0477
72-0596
Residues/Plants
72-0132 72-0473
Residues/Soil
72-0261 72-0302
72-0303
Residues/Water
72-0266
Residues/Wildlife
72-0044 72-0261
72-0266
Toxicity/Experimental
Animals
72-0132 72-0150
72-0169 72-0177
72-0338 72-0595
Toxicity/Wildlife
72-0376
DDVP
see Dichlorvos
Analysis
72-0502
Photodecomposition
72-0502
DEDTC
Nervous System
72-0364
Toxicity/Experimental
Animals
72-0364
Delachlor
Analysis
72-0317
Residues/Food and Feed
72-0317
Residues/Plants
72-0317
Delnav
see also Organophates
Analysis
72-0376
Enzyme activity
72-0376
Toxicity/Experimental
Animals
72-0376
Demeton
see also Organophosphates
Analysis
72-0376
Enzyme activity
72-0376
Factors Influencing
Metabolism/Toxicity
72-0117
Laws and Regulations
72-0237 72-0243
Residues/Food and Feed
72-0243
Residues/Water
72-0243
Toxicity/Experimental
Animals
72-0117 72-0376
Toxicity/Humans
72-0237 72-0243
Toxicity/Wildlife
72-0237 72-0243
Demeton methyl
see also Organophosphates
Analysis
72-0215
Digestive System
72-0215
Metabolism
72-0215
Toxicity/Experimental
Animals
72-0215
Demphion
Analysis
72-0414
Dexon
see also Fungicides
Benefical Effects
72-0032
Residues/Soil
72-0032
DFP
see also Organophosphates
Blood/Body fluids
72-0592 72-0593
Cardiovascular System
72-0593
Cytological Effects
72-0609
Digestive System
72-0592 72-0609
Endocrine System
72-0593
Enzyme activity
72-0133 72-0145
72-0377 72-0585
72-0592
Enzyme Activity
72-0593 72-0609
Excretory System
72-0609
Factors Influencing
Metabolism/Toxicity
72-0133
Musculoskeletal System
72-0377 72-0593
Nervous System
72-0145 72-0377
72-0585 72-0592
72-0593
Toxicity/Experimental
Animals
72-0133 72-0145
72-0377 72-0592
72-0593 72-0610
Toxicity/Humans
72-0585
Treatment of Poisoning
72-0145 72-0610
DGA
see n-Dodecylguanidine
acetate

Diallate
Analysis
72-0317 72-0388
Residues/Food and Feed
72-0317 72-0388
Residues/Plants
72-0317

Diazinon
Alternative controls
72-0242 72-0469
Analysis
72-0230 72-0249
72-0404 72-0410
72-0471 72-0639
Enzyme activity
72-0471
Metabolism
72-0471
Nervous System
72-0230
Photodecomposition
72-0471
Prevention
72-0469
Residue Degradation
72-0249 72-0471
Residues/Food and Feed
72-0410 72-0469
Residues/Plants
72-0410
Residues/Soil
72-0249 72-0311
72-0410
Spectrometry
72-0404
Toxicity/Experimental Animals
72-0471
Toxicity/Wildlife
72-0230 72-0334

Diazinon analogs and metabolites
Analysis
72-0471
Enzyme activity
72-0471
Metabolism
72-0471
Photodecomposition
72-0471
Residue Degradation
72-0471
Toxicity/Experimental Animals
72-0471

Dibromochloropropane
Prevention
72-0333

1,2-Dibromo-3-chloropropane
see DBCP

1,3-Dibromoethane
see EDB

3,5-Di-tert-butylphenyl-N-methylcarbamate
see Butacarb

Dicamba
Analysis
72-0354 72-0355
72-0380 72-0398
72-0399 72-0400
Metabolism
72-0354 72-0355
Prevention
72-0333
Residue Degradation
72-0294
Residues/Plants
72-0354 72-0355
Residues/Soil
72-0398 72-0399
72-0400

Dichlobenil
see also Herbicide
Residue Dynamics
72-0070
Residues/Soil
72-0070 72-0290
Residues/Water
72-0290

Dichlormate
Analysis
72-0388
Residues/Food and Feed
72-0388

2,3-Dichlorodibenzo-p-dioxin
Analysis
72-0395

Dichloromethane
Analysis
72-0413
Residues/Food and Feed
72-0413

2,4-Dichlorophenol
see DCP

2,4-Dichlorophenoxyacetic acid
see 2,4-D

5,6-dichloro-1-phenoxy-carbonyl-2-trifluoromethylbenzimidazo
see Lovozal

1,3-Dichloropropane
see 1,3-D

trans-4,4'-Dichlorostilbene
Carcinogenesis
72-0132
Factors Influencing Metabolism/Toxicity
72-0132
Residues/Plants
72-0132
Toxicity/Experimental Animals
72-0132

Dichlorvos
see also Organophosphates
Analysis
72-0036 72-0382
72-0476
Biochemical effects
72-0348
Digestive System
72-0348
Enzyme activity
72-0165 72-0551
72-0564
Factors Influencing Metabolism/Toxicity
72-0165
Laws and Regulations
72-0243
Metabolism
72-0348
Nervous System
72-0165
Residues/Domestic Animals
72-0382
Residues/Food and Feed
72-0036 72-0243
72-0476
Residues/Water
72-0243
Toxicity/Domestic Animals
72-0453
Toxicity/Experimental Animals
72-0165 72-0564
Toxicity/Humans
72-0243 72-0551
Toxicity/Wildlife
72-0243

Dichlorzoline
Analysis
72-0418
Residues/Food and Feed
72-0418

Dicofol
see also Organochlorines
Analysis

72-0036 72-0262
72-0263
Cytological effects
72-0376 72-0603
Enzyme activity
72-0376 72-0562
72-0603
Excretory System
72-0376 72-0562
72-0603
Musculoskeletal system
72-0376
Nervous System
72-0376 72-0603
Residues/Food and Feed
72-0036
Residues/Soil
72-0262 72-0263
Respiratory System
72-0603
Toxicity/Wildlife
72-0376 72-0562
72-0603
Dicotex
see MCPA
Dicrotophos
see also Organophosphates
Analysis
72-0207
Enzyme activity
72-0165 72-0369
Factors Influencing Metabolism/Toxicity
72-0117 72-0165
Laws and Regulations
72-0243
Nervous System
72-0165 72-0369
Residues/Food and Feed
72-0243
Residues/Water
72-0243
Sensory System
72-0369
Toxicity/Experimental Animals
72-0117 72-0165
Toxicity/Humans
72-0243
Toxicity/Wildlife
72-0243 72-0369
Dicumarol
Blood/Body fluids
72-0168
Factors Influencing Metabolism/Toxicity
72-0168
Reproduction/Growth
72-0168
Toxicity/Experimental Animals
72-0168
Dieldrin
see also Aldrin derived compounds, Organochlorines
Alternative controls
72-0242
Analysis
72-0036 72-0175
72-0213 72-0218
72-0249 72-0255
72-0256 72-0257
72-0259 72-0260
72-0261 72-0262
72-0263 72-0266
72-0267 72-0269
72-0278 72-0303
72-0352 72-0358
72-0365 72-0402
72-0403 72-0404
72-0473 72-0474
72-0477 72-0482
72-0485 72-0557
72-0631 72-0638
72-0644 72-0656
Biochemical effects
72-0574
Blood/Body fluids
72-0365 72-0557
72-0600
Cardiovascular system
72-0365
Cytological Effects
72-0614
Digestive System
72-0044 72-0278
72-0358 72-0482
72-0600
Electrometry
72-0404
Environmental Pollution
72-0240
Enzyme Activity
72-0362 72-0614
Excretory System
72-0532 72-0600
Factors Influencing Metabolism/Toxicity
72-0044 72-0117
72-0457 72-0532
72-0600
Integument
72-0199
Laws and Regulations
72-0060 72-0243
72-0244 72-0437
Metabolism
72-0044 72-0175
72-0188 72-0192
72-0198 72-0358
72-0362 72-0457
72-0532 72-0600
Musculoskeletal system
72-0278
Nervous System
72-0199 72-0600
Prevention
72-0244 72-0333
72-0509
Reproduction/Growth
72-0064 72-0100
72-0107 72-0198
72-0312 72-0324
72-0344 72-0347
72-0532 72-0557
72-0574
Residue Degradation
72-0065 72-0073
72-0192 72-0249
72-0277 72-0294
72-0457 72-0485
72-0656
Residue Dynamics
72-0064
Residue Removal
72-0474 72-0475
72-0485
Residue/Air
72-0213
Residues/Food and Feed
72-0036 72-0060
72-0240 72-0243
72-0256 72-0450
72-0475 72-0477
72-0644
Residues/Humans
72-0240 72-0557
72-0262 72-0263
72-0303 72-0457
72-0644
Residues/Plants
72-0064 72-0473
72-0474 72-0509
72-0644
Residues/Soil
72-0065 72-0073
72-0240 72-0249
72-0256 72-0257
72-0260 72-0261
Residues/Water
72-0062 72-0243
72-0266 72-0267
72-0644
Residues/Wildlife
72-0044 72-0062

72-0064 72-0175
72-0198 72-0199
72-0255 72-0259
72-0260 72-0261
72-0266 72-0267
72-0312 72-0482
Respiratory System
72-0195
Therapeutic use
72-0362
Toxicity/Domestic Animals
72-0244
Toxicity/Experimental Animals
72-0117 72-0192
72-0240 72-0344
72-0358 72-0362
72-0437 72-0600
Toxicity/Humans
72-0240 72-0243
72-0244 72-0509
72-0532 72-0557
Toxicity/Wildlife
72-0100 72-0175
72-0195 72-0198
72-0199 72-0240
72-0243 72-0244
72-0278 72-0324
72-0352
Treatment of Poisoning
72-0611

Dieldrin derived compounds
see also Organochlorines
Analysis
72-0154
Biochemical effects
72-0154
Blood/Body fluids
72-0600
Cytological effects
72-0154
Digestive System
72-0154 72-0600
Enzyme activity
72-0154
Excretory System
72-0600
Factors Influencing Metabolism/Toxicity
72-0600
Metabolism
72-0154 72-0600
Nervous System
72-0600
Reproduction/Growth
72-0154 72-0347
Toxicity/Experimental Animals
72-0600

Diethion
Analysis
72-0289
Residues/Plants
72-0289

Diethyl 4,4-o-phenylene-3,3'-dithiodiallophanate
see Topsin

Diethyldithn carbamate
see DEDTC

Difolatan
Analysis
72-0318 72-0515
Integument
72-0515
Residues/Plants
72-0318
Toxicity/Humans
72-0515
nd Feed
72-0318

Dimetan
see also Carbamates
Analysis
72-0601
Blood/Body fluids
72-0601
Enzyme activity
72-0601
Toxicity/Experimental Animals
72-0601

Dimethoate
see also Organophosphates
Alternative controls
72-0242 72-0469
Analysis
72-0215 72-0289
72-0376 72-0410
72-0419
Digestive System
72-0215
Enzyme activity
72-0376
Laws and Regulations
72-0243
Metabolism
72-0215
Prevention
72-0469
Residues/Food and Feed
72-0243 72-0410
72-0469
Residues/Plants
72-0289 72-0410
72-0419
Residues/Soil
72-0410
Residues/Water
72-0243
Toxicity/Domestic Animals
72-0453
Toxicity/Experimental Animals
72-0215 72-0376
Toxicity/Humans
72-0243
Toxicity/Wildlife
72-0243

Dimethoate derived compounds
see also Organophosphates
Enzyme activity
72-0122
Toxicity/Experimental Animals
72-0122

Dimethoxon
see Dimethoate derived compounds

2,3-Dimethyl-3-furancarboxylic acid anilide
see BAS 3191

O,O-Dimethyl-2,2-dichlorovinyl phosphate
see DDVP

O,O-Dimethyl-2,2,2-trichloro-1-hydroxy-ethyl phosphonate
see Dipterex

O,O-Diisopropyl S-benzyl thiophosphate
see Kitazin-P

Dimetilan
see also Carbamates
Analysis
72-0601
Blood/Body fluids
72-0601
Enzyme activity
72-0601
Toxicity/Experimental Animals
72-0601

Dinobuton
Biochemical effects
72-0598
Blood/Body fluids
72-0598
Metabolism
72-0598
Toxicity/Domestic Animals
72-0598

Dinobuton derived compounds
Biochemical effects

72-0598
Blood/Body fluids
72-0598
Metabolism
72-0598
Toxicity/Domestic Animals
72-0598
Dinoseb
see also Herbicides
Analysis
72-0172 72-0406
Biochemical effects
72-0172
Reproduction/Growth
72-0172
Dioxin
Factors Influencing Metabolism/Toxicity
72-0345
Laws and Regulations
72-0345
Musculoskeletal system
72-0345
Mutagenesis/ Teratogenesis
72-0345
Toxicity/Experimental Animals
72-0345
Diphenamid
Analysis
72-0398 72-0399
Factors Influencing Metabolism/Toxicity
72-0458
Metabolism
72-0458
Residue Degradation
72-0458
Residues/Food and Feed
72-0458
Residues/Soil
72-0398 72-0399
Diquat
Analysis
72-0399 72-0640
Metabolism
72-0563
Residues/Soil
72-0399 72-0563
72-0640
Residues/Water
72-0563
Disodium methanearsonate
see DSMA
Disulfiram
Nervous System
72-0364
Toxicity/Experimental Animals
72-0364
Disulfoton
see also Organophosphates
Analysis
72-0211 72-0272
72-0354 72-0376
72-0390
Enzyme activity
72-0376
Laws and Regulations
72-0243
Metabolism
72-0354
Morbidity and Mortality Statistics
72-0087
Residue Removal
72-0272
Residues/Food and Feed
72-0211 72-0243
72-0272
Residues/Plants
72-0354
Residues/Water
72-0243
Toxicity/Experimental Animals
72-0376
Toxicity/Humans
72-0087 72-0243
Toxicity/Wildlife
72-0243
Di-syston
see Disulfoton
Disyston
see Disulfoton
Dithane M-22
Analysis
72-0389
Residues/Food and Feed
72-0389
Dititex
see MCPA
Diuron
see also Herbicides
Analysis
72-0079 72-0249
72-0387 72-0399
Prevention
72-0333
Residue Degradation
72-0049 72-0249
72-0294
Residue Dynamics
72-0049 72-0053
72-0079
Residues/Soil
72-0049 72-0053
72-0079 72-0249
72-0290 72-0399
Residues/Water
72-0290
DME
see DDT derived compounds
DMSO
Analysis
72-0646
DNBP
see Dinobuton derived compounds
see Dinoseb
Analysis
72-0380
Prevention
72-0333
Residue Degradation
72-0294
DNOC
Analysis
72-0380
Metabolism
72-0563
Residues/Soil
72-0563
Residues/Water
72-0563
n-Dodecylguanidine acetate
Analysis
72-0227
Residues/Water
72-0227
Dodine
see also Fungicide
Factors Influencing Metabolism/Toxicity
72-0159
Toxicity/Experimental Animals
72-0159
Dowpon
see Dalapon-Na
DSMA
Prevention
72-0333
Residue Degradation
72-0294
DTMC
see DDT derived compounds
Dursban
see also Organophosphates
Enzyme activity
72-0369

Factors Influencing Metabolism/Toxicity 72-0117
Nervous System 72-0369
Residues/Food and Feed 72-0575
Sensory System 72-0369
Toxicity/Experimental Animals 72-0117 72-0575
Toxicity/Wildlife 72-0334 72-0369 72-0575

Dyfonate
see also Organophosphates
Analysis 72-0354 72-0355
Factors Influencing Metabolism/Toxicity 72-0078
Metabolism 72-0354 72-0355
Residue Degradation 72-0078
Residue Dynamics 72-0077
Residues/Plants 72-0354 72-0355
Residues/Soil 72-0077 72-0078

Dykol
see DDT

Dyrene
see also Fungicides
Analysis 72-0657
Integument 72-0516
Toxicity/Humans 72-0516

EDB
Residue Degradation 72-0292
Residues/Soil 72-0292

EDEM
see O-Ethyl-S-(2-diethylaminoethyl) methylthiophosphonate

EDEMS
Enzyme activity 72-0361
Musculoskeletal system 72-0361
Nervous System 72-0361

Endosulfan
see also Organochlorines
Alternative controls 72-0242
Analysis 72-0262 72-0263 72-0402 72-0465 72-0480 72-0538
Cytological effects 72-0603
Enzyme activity 72-0562 72-0603
Excretory System 72-0562 72-0603
Laws and Regulations 72-0243 72-0244
Metabolism 72-0480
Toxicity/Experimental Animals 72-0361

EDMM
see O-Ethyl-S-(2-dimethylaminoethyl) methylthiophosphonate
Nervous System 72-0603
Prevention 72-0244 72-0320
Residue Degradation 72-0073 72-0480
Residue Removal 72-0480
Residues/Food and Feed 72-0243 72-0538
Residues/Soil 72-0073 72-0262 72-0263 72-0483
Residues/Water 72-0034 72-0160 72-0243 72-0320 72-0465
Respiratory System 72-0603
Toxicity/Domestic Animals 72-0244 72-0538
Toxicity/Experimental Animals 72-0160
Toxicity/Humans 72-0243 72-0244
Toxicity/Wildlife 72-0160 72-0243 72-0244 72-0320 72-0562 72-0603

Endosulfan derived compounds
Analysis 72-0390 72-0480
Metabolism 72-0480
Residue Degradation 72-0480
Residue Removal 72-0480

Endothall
Analysis 72-0317
Residues/Food and Feed 72-0317
Residues/Plants 72-0317

Endrin
see also Organochlorines
Alternative controls 72-0242
Analysis 72-0036 72-0262 72-0263 72-0269 72-0403 72-0408 72-0477 72-0485 72-0579 72-0644
Biochemical effects 72-0105
Carcinogenesis 72-0166
Cardiovascular system 72-0166
Cytological effects 72-0376 72-0579 72-0614
Digestive System 72-0105 72-0166 72-0579
Endocrine system 72-0166
Enzyme activity 72-0376 72-0614
Excretory System 72-0376
Factors Influencing Metabolism/Toxicity 72-0105 72-0166 72-0441
Integument 72-0187
Laws and Regulations 72-0243 72-0244 72-0437 72-0441 72-0442
Metabolism 72-0441 72-0579
Morbidity and Mortality Statistics 72-0086 72-0441

Musculoskeletal system
72-0376
Nervous System
72-0105 72-0166
72-0187 72-0376
72-0579
Prevention
72-0244 72-0442
Reproduction/Growth
72-0166 72-0347
Residue Degradation
72-0441 72-0485
Residue Removal
72-0475 72-0485
Residues/Food and Feed
72-0036 72-0243
72-0441 72-0450
72-0475 72-0477
72-0644
Residues/Humans
72-0441
Residues/Plants
72-0644
Residues/Soil
72-0262 72-0263
72-0644
Residues/Water
72-0062 72-0243
72-0644
Residues/Wildlife
72-0062 72-0105
Respiratory System
72-0166
Sensory System
72-0187
Toxicity/Domestic Animals
72-0244
Toxicity/Experimental Animals
72-0166 72-0437
72-0579
Toxicity/Humans
72-0086 72-0243
72-0244 72-0441
Toxicity/Wildlife
72-0105 72-0187
72-0243 72-0244
72-0376 72-0579

Endrin derived compounds
Analysis
72-0225

EPN
see also Organophosphates
Analysis
72-0376
Enzyme activity
72-0376
Factors Influencing Metabolism/Toxicity
72-0117
Residues/Food and Feed
72-0450
Toxicity/Experimental Animals
72-0117 72-0376

EPTC
Analysis
72-0388
Residues/Food and Feed
72-0388

Eserine
Enzyme activity
72-0585
Nervous System
72-0585
Toxicity/Humans
72-0585

Ethion
see also Organophosphates
Analysis
72-0376 72-0390
Enzyme activity
72-0376
Laws and Regulations
72-0243
Residues/Food and Feed
72-0243
Residues/Water
72-0243
Toxicity/Experimental Animals
72-0376
Toxicity/Humans
72-0243
Toxicity/Wildlife
72-0243

Ethoate-methyl
Laws and Regulations
72-0243
Residues/Food and Feed
72-0243
Residues/Water
72-0243
Toxicity/Humans
72-0243
Toxicity/Wildlife
72-0243

Ethoxychlor
Residues/Water
72-0577
Residues/Wildlife
72-0577
Toxicity/Experimetnal Animals
72-0577
Toxicity/Wildlife
72-0577

Ethyl N-(3-chloro-4-methoxyphenyl)carbamate
see also Carbamates
Residue Degradation
72-0045
Residues/Soil
72-0045

Ethyl 4,4'-dichlorobenzilate
see Chlorobenzilate

O-Ethyl-S-(2-diethylaminoethyl) methylthiophosphonate
see also Organophosphates
Enzyme activity
72-0585
Nervous System
72-0585
Toxicity/Humans
72-0585

O-Ethyl-S-(2-dimethylaminoethyl) methylthiophosphonate
see also Organophosphates
Cardiovascular System
72-0590
Enzyme activity
72-0585 72-0590
Musculoskeletal System
72-0590
Nervous System
72-0585 72-0590
Respiratory System
72-0590
Toxicity/Experimental Animals
72-0590
Toxicity/Humans
72-0585

Ethylene dibromide
see also Fumigants
Analysis
72-0647
Residue/Air
72-0647

Ethylene dichloride
see also Fumigants
Analysis
72-0647
Residue/Air
72-0647

Ethylene oxide
see also Fumigants
Analysis
72-0647
Residue/Air
72-0647

Ethylene thiourea
Analysis
72-0301
Residues/Food and Feed
72-0301
Residues/Soil
72-0301
Ethylenethiourea
see Carbamates
FAA
see Fluoroacetamide
Famphur
Analysis
72-0580
Biochemical effects
72-0580
Digestive System
72-0580
Enzyme activity
72-0580
Metabolism
72-0580
Residue Degradation
72-0580
Fenac
Analysis
72-0398 72-0399
72-0400
Residues/Soil
72-0398 72-0399
72-0400
Fenitrothion
see also Organophosphates
Analysis
72-0029 72-0075
Blood/body fluids
72-0373
Digestive System
72-0373
Enzyme activity
72-0373
Laws and Regulations
72-0243
Residue Dynamics
72-0029
Residues/Food and Feed
72-0243
Residues/Soil
72-0029
Residues/Water
72-0243
Toxicity/Experimental Animals
72-0373
Toxicity/Humans
72-0243
Toxicity/Wildlife
72-0243
Fensulfothion
Analysis
72-0354
Laws and Regulations
72-0243
Metabolism
72-0354
Residues/Food and Feed
72-0243
Residues/Plants
72-0354
Residues/Water
72-0243
Toxicity/Humans
72-0243
Toxicity/Wildlife
72-0243
Fenthion
see also Organophosphates
Analysis
72-0211 72-0376
72-0639
Enzyme activity
72-0368 72-0376
Factors Influencing Metabolism/Toxicity
72-0047 72-0117
Laws and Regulations
72-0243
Metabolism
72-0047
Residue Degradation
72-0047
Residues/Domestic Animals
72-0047
Residues/Food and Feed
72-0211 72-0243
Residues/Water
72-0243
Toxicity/Domestic Animals
72-0368
Toxicity/Experimental Animals
72-0117 72-0376
Toxicity/Humans
72-0243
Toxicity/Wildlife
72-0243 72-0334
Fenuron
Analysis
72-0387
Florisil
Analysis
72-0385
Fluenethyl
Analysis
72-0642
Residues/Food and Feed
72-0642
Fluometuron
see also Herbicides
Analysis
72-0079
Factors Influencing Metabolism/Toxicity
72-0051
Residue Degradation
72-0049
Residue Dynamics
72-0049 72-0079
Residues/Soil
72-0051 72-0079
Fluoroacetamide
see also Rodenticide, Rodenticides
Biochemical effects
72-0341 72-0589
Blood/Body fluids
72-0589
Cardiovascular System
72-0588 72-0589
Cytological effects
72-0589
Digestive System
72-0588
Endocrine System
72-0588
Enzyme activity
72-0589
Excretory System
72-0588 72-0589
Musculoskeletal System
72-0588
Residues/Soil
72-0049
Respiratory System
72-0588
Toxicity/Experimental Animals
72-0341 72-0588
72-0589
Treatment of Poisoning
72-0341
Folex
see also Organophosphates
Analysis
72-0376
Enzyme activity
72-0376
Toxicity/Experimental Animals
72-0376
Folpet
see also Fungicides
Analysis
72-0120

Biochemical effects
72-0120
Enzyme activity
72-0120
Folpet derived compounds
see also Fungicides
Analysis
72-0120
Biochemical effects
72-0120
Enzyme activity
72-0120
Formetanate
see also Carbamates
Analysis
72-0601
Blood/Body fluids
72-0601
Enzyme activity
72-0601
Toxicity/Experimental Animals
72-0601
Formothion
Laws and Regulations
72-0243
Residues/Food and Feed
72-0243 72-0306
Residues/Water
72-0243
Toxicity/Humans
72-0243
Toxicity/Wildlife
72-0243
Fosfotion
see Malathion
Fumigants
see also Acrylonitrile, Carbon disulfide, Carbon tetrachloride, Chloropicrin, D-D, Ethylene dibromide, Ethylene dichloride, Ethylene oxide, Methyl bromide, Methylene chloride, Phosphine
Fungicides
see also Benomyl, Bordeaux mixture, Captan, Carboxin derived compounds, Copper sulfate Chlorothalonil, Conen, Dodine, Tridemorph, Dexon, Dyrene, Folpet, Folpet derived compounds, Hexachlorobenzene, Mercurials, Metham, Panogen, Phenylmercuric acetate, Thiabendazole, Thiophanate, Thiophanate derived compounds, Thiophanate-methyl
Carboxin
72-0125
Experimental Design
72-0234
Gardona
see also Organophosphates
Analysis
72-0360
Beneficial Effects
72-0527
Enzyme Activity
72-0527
Metabolism
72-0360
Toxicity/Experimental Animals
72-0360
Toxicity/Humans
72-0527
Gramoxone
see Paraquat
GS-15171
see also Carbamates
Analysis
72-0601
Blood/Body fluids
72-0601
Enzyme activity
72-0601
Toxicity/Experimental Animals
72-0601
Gusathion
see Azinphosmethyl
Guthion
see Azinphosmethyl

HCS 3260
see Chlordane
HEOD
see Dieldrin
Heptachlor
see also Organochlorines
Alternative controls
72-0242
Analysis
72-0036 72-0176
72-0218 72-0249
72-0256 72-0262
72-0263 72-0269
72-0352 72-0402
72-0404 72-0461
72-0474 72-0477
72-0485 72-0653
Blood/body fluids
72-0373
Carcinogenesis
72-0288
Cytological effects
72-0376
Cytological Effects
72-0614
Digestive System
72-0373 72-0448
72-0565
Electrometry
72-0404
Enzyme activity
72-0373 72-0376
72-0565 72-0614
Excretory System
72-0376
Laws and Regulations
72-0060 72-0243
72-0244
Metabolism
72-0176
Musculoskeletal system
72-0376
Nervous System
72-0376
Prevention
72-0244 72-0509
Residue Degradation
72-0249 72-0485
Residue Removal
72-0474 72-0485
Residue/Air
72-0288
Residues/Food and Feed
72-0036 72-0060
72-0243 72-0256
72-0313 72-0448
72-0477 72-0653
Residues/Humans
72-0448
Residues/Plants
72-0461 72-0474
72-0509
Residues/Soil
72-0249 72-0256
72-0262 72-0263
72-0461
Residues/Water
72-0062 72-0243
Residues/Wildlife
72-0062
Toxicity/Domestic Animals
72-0176 72-0244
72-0448
Toxicity/Experimental Animals
72-0373 72-0448
72-0565

Toxicity/Humans
72-0243 72-0244
72-0509
Toxicity/Wildlife
72-0243 72-0244
72-0352 72-0376

Heptachlor epoxide
Analysis
72-0176 72-0218
72-0256 72-0260
72-0262 72-0263
72-0278 72-0410
72-0461 72-0473
72-0474 72-0477
72-0638
Cytological effects
72-0376
Cytological Effects
72-0614
Digestive System
72-0278
Enzyme activity
72-0376
Enzyme Activity
72-0614
Excretory System
72-0376
Laws and Regulations
72-0060
Metabolism
72-0176
Musculoskeletal system
72-0278 72-0376
Nervous System
72-0376
Residue Removal
72-0474 72-0475
Residues/Food and Feed
72-0060 72-0256
72-0410 72-0475
72-0477
Residues/Plants
72-0410 72-0461
72-0473 72-0474
Residues/Soil
72-0256 72-0260
72-0262 72-0263
72-0410 72-0461
Residues/Water
72-0062
Residues/Wildlife
72-0062 72-0260
Toxicity/Domestic Animals
72-0176
Toxicity/Wildlife
72-0278 72-0376

Herbicide 243
see Herbicides

Herbicides
see also p-Chlorophenyl N-methylcarbamate, Ametryne, Amitrole, Arsenicals, Atrazine, Bromacil, Chlormequat chloride, Chlorpropham, Chlorthiamid, Dalapon-Na, Dichlobenil, Dinoseb, Diuron, Fluometron, Fluometuron, Linuron, Metoxuron, MCPA, MCPB, MSMA, Norea, Paraquat Pentachlorophenol, Phemedipham, Phenmedipham, Picloram, Prometryne, PCP, Silvex, Simazine, Sodium chlorate, Terbacil, Triallate, Vernolate, WL-19805, 1-Naphthaleneacetic acid, 2,4-D, 2,4-D derived compounds, 2,4-D esters, 2,4,5-T, 2,4,5-T esters
Sodium chlorate
72-0134
Associations/ Organizations
72-0020
Benefical Effects
72-0002
Biochemical effects
72-0071
Education/Training
72-0232
Environmental Pollution
72-0424
Factors Intluencing Metabolism/Toxicity
72-0033
Laws and Regulations
72-0068 72-0232
72-0424 72-0425
Mutagenesis/ Teratogenesis
72-0573
Nervous System
72-0157
Prevention
72-0033
Residue Degradation
72-0068
Residue Dynamics
72-0068
Residues/Soil
72-0068 72-0071
Residues/Water
72-0068
Toxicity/Experimental Animals
72-0157
Toxicity/Wildlife
72-0002 72-0020

Hexachlorobenzene
see also Fungicides
Analysis
72-0218

Hinosan
Analysis
72-0211
Residues/Food and Feed
72-0211

HS 6
see also Bispyridinium compounds
Blood/Body fluids
72-0119
Enzyme Activity
72-0119

HS 8
see also Bispyridinium compounds
Blood/Body fluids
72-0119
Enzyme Activity
72-0119

3-Hydroxy-p-(methylthio)-alpha-methyl benzyl cis-crotonate
see SD-14045

Insecticides
Analysis
72-0003
Environmental Pollution
72-0233
Prevention
72-0003
Toxicity/Experimental Animals
72-0003
Toxicity/Humans
72-0003

Intration
see Thiometon

Ipronidazole
Analysis
72-0381
Digestive System
72-0381
Excretory System
72-0381
Toxicity/Domestic Animals
72-0381

Isobutyl ester 2,4-D
see 2,4-D esters

Isodrin
Analysis
72-0352

Toxicity/Wildlife
72-0352
Isolane
see also Carbamates
Analysis
72-0601
Blood/Body fluids
72-0601
Enzyme activity
72-0601
Toxicity/Experimental Animals
72-0601
Isopropyl methyl phosphonofluoridate
see Sarin
Isopropyl 4,4'-dibromobenzilate
see Bromopropylate
Isopropyl 4,4'-dichlorobenzilate
see Chloropropylate
Jasmolins
see Pyrethrins

Karatan
Analysis
72-0406
Kerb
Analysis
72-0354 72-0355
Metabolism
72-0354 72-0355
Residues/Plants
72-0354 72-0355
Kerosene
Residues/Water
72-0330
Toxicity/Wildlife
72-0330
Kitazin-P
see also Organophosphates
Factors Influencing Metabolism/Toxicity
72-0159
Toxicity/Experimental Animals
72-0159
Kuprikol
see Copper oxychloride
Landrin
see also Carbamates
Factors Influencing Metabolism/Toxicity
72-0117
Toxicity/Experimental Animals
72-0117 72-0144
Lead
Biochemical effects
72-0350
Enzyme activity
72-0350
Factors Influencing Metabolism/Toxicity
72-0350
Metabolism
72-0350
Toxicity/Experimental Animals
72-0350
Lead arsenate
Alternative controls
72-0242
Digestive System
72-0322
Laws and Regulations
72-0243
Metabolism
72-0322
Residues/Food and Feed
72-0243
Residues/Water
72-0243
Toxicity/Domestic Animals
72-0322
Toxicity/Humans
72-0243
Toxicity/Wildlife
72-0243
Lindane
see also Organochlorines
Alternative controls
72-0242
Analysis
72-0036 72-0063
72-0218 72-0249
72-0256 72-0257
72-0262 72-0263
72-0289 72-0303
72-0408 72-0410
72-0412 72-0421
72-0465 72-0477
72-0485 72-0638
72-0649
Biochemical effects
72-0574
Blood/Body fluids
72-0554
Carcinogenesis
72-0288
Cytological Effects
72-0614
Enzyme Activity
72-0614
Factors Influencing Metabolism/Toxicity
72-0441
Laws and Regulations
72-0060 72-0237
72-0243 72-0244
72-0438 72-0441
Metabolism
72-0063 72-0086
72-0198 72-0441
Morbidity and Mortality Statistics
72-0086 72-0087
72-0441
Prevention
72-0244
Reproduction/Growth
72-0107 72-0198
72-0574
Residue Degradation
72-0073 72-0249
72-0293 72-0441
72-0485
Residue Dynamics
72-0074
Residue Removal
72-0475 72-0485
Residue/Air
72-0288
Residues/Domestic Animals
72-0299
Residues/Food and Feed
72-0036 72-0060
72-0243 72-0256
72-0299 72-0410
72-0441 72-0475
72-0477
Residues/Humans
72-0441 72-0554
Residues/Plants
72-0063 72-0289
72-0299 72-0410
Residues/Soil
72-0073 72-0074
72-0249 72-0256
72-0257 72-0262
72-0263 72-0299
72-0303 72-0410
Residues/Water
72-0062 72-0063
72-0243 72-0287
72-0465
Residues/Wildlife
72-0062 72-0198
Toxicity/Domestic Animals
72-0244

Toxicity/Humans
72-0086 72-0087
72-0237 72-0243
72-0244 72-0441
72-0554
Toxicity/Wildlife
72-0198 72-0237
72-0243 72-0244

Linuron
see also Herbicides
Analysis
72-0172 72-0354
72-0355 72-0387
Biochemical effects
72-0172
Enzyme activity
72-0454
Metabolism
72-0354 72-0355
72-0454
Reproduction/Growth
72-0172
Residue Degradation
72-0454
Residues/Plants
72-0354 72-0355

Lovoxal
Analysis
72-0405
Residues/Food and Feed
72-0405
Residues/Soil
72-0405

Malathion
see also Organophosphates
Alternative controls
72-0242
Analysis
72-0036 72-0090
72-0106 72-0215
72-0249 72-0289
72-0354 72-0355
72-0404 72-0410
72-0412 72-0580
72-0632 72-0639
72-0657
Biochemical effects
72-0580
Blood/Body fluids
72-0097
Carcinogenesis
72-0288
Cardiovascular system
72-0097
Digestive System
72-0215 72-0580
Enzyme activity
72-0096 72-0106
72-0143 72-0369
72-0580 72-0585
Laws and Regulations
72-0237
Metabolism
72-0106 72-0215
72-0354 72-0355
72-0563 72-0580
Morbidity and Mortality Statistics
72-0087 72-0097
Musculoskeletal system
72-0090 72-0097
Nervous System
72-0090 72-0369
72-0585
Prevention
72-0333
Residue Degradation
72-0106 72-0249
72-0294 72-0580
Residue/Air
72-0288
Residues/Food and Feed
72-0036 72-0410
72-0450
Residues/Plants
72-0289 72-0354
72-0355 72-0410
Residues/Soil
72-0249 72-0410
72-0563
Residues/Water
72-0563
Respiratory System
72-0090 72-0195
Sensory System
72-0369
Toxicity/Experimental Animals
72-0143 72-0215
Toxicity/Humans
72-0087 72-0090
72-0091 72-0093
72-0096 72-0097
72-0237 72-0585
Toxicity/Wildlife
72-0195 72-0237
72-0369
Treatment of Poisoning
72-0090 72-0093
72-0096 72-0097
72-0143

Maldison
Alternative controls
72-0469
Laws and Regulations
72-0243
Prevention
72-0469
Residues/Food and Feed
72-0243 72-0469
Residues/Water
72-0243
Toxicity/Humans
72-0243
Toxicity/Wildlife
72-0243

Mancozeb
Cytological Effects
72-0558
Endocrine System
72-0558
Toxicity/Experimental Animals
72-0558

Maneb
Analysis
72-0289 72-0301
72-0389
Cytological Effects
72-0558
Endocrine System
72-0558
Metabolism
72-0055
Residue Degradation
72-0055
Residues/Food and Feed
72-0055 72-0301
72-0389
Residues/Plants
72-0289
Residues/Soil
72-0301
Toxicity/Experimental Animals
72-0558

Matacil
see Aminocarb

MCP
Analysis
72-0282
Residues/Food and Feed
72-0282

MCPA
see also Herbicides
Immunology
72-0082
Integument
72-0082
Metabolism
72-0563
Prevention
72-0082
Residues/Soil
72-0563
Residues/Water
72-0563

Toxicity/Humans
72-0082

HCPB
see also Herbicides
Metabolism
72-0162

HCPP
Analysis
72-0380

Henazon
see also Organophosphate
Alternative controls
72-0242
Laws and Regulations
72-0243
Residues/Food and Feed
72-0110 72-0243
Residues/Water
72-0243
Toxicity/Experimental Animals
72-0110
Toxicity/Humans
72-0243
Toxicity/Wildlife
72-0243

Heobal
see also Carbamates
Factors Influencing Metabolism/Toxicity
72-0140
Metabolism
72-0140
Residue Degradation
72-0140

Heobal derived compounds
see also Carbamates
Factors Influencing Metabolism/Toxicity
72-0140
Metabolism
72-0140
Residue Degradation
72-0140

Hercurials
see also Fungicides, Metallic compounds, Panogen, Phenylmercuric acetate
Analysis
72-0329 72-0540
Cytological Effects
72-0541
Digestive System
72-0540
Environmental Pollution
72-0025 72-0098
Factors Influencing Metabolism/Toxicity
72-0332 72-0536
72-0541
Laws and Regulations
72-0541
Morbidity and Mortality Statistics
72-0086 72-0098
Mutagenesis/ Teratogenesis
72-0541
Nervous System
72-0086 72-0332
72-0540 72-0541
Prevention
72-0536
Reproduction/Growth
72-0086 72-0329
Residues/Food and Feed
72-0536 72-0540
72-0541
Residues/Humans
72-0098
Residues/Water
72-0025
Residues/Wildlife
72-0098 72-0329
72-0540
Toxicity/Domestic Animals
72-0536
Toxicity/Humans
72-0086 72-0098
72-0332 72-0536
Toxicity/Wildlife
72-0025 72-0098
72-0540 72-0541
Treatment of Poisoning
72-0536

Mercury
Analysis
72-0451
Digestive System
72-0236
Musculoskeletal System
72-0236
Residues/Food and Feed
72-0451
Residues/Humans
72-0451
Residues/Wildlife
72-0236

Mesurol
see also Carbamates
Methocarb
72-0180
Analysis
72-0601
Blood/Body fluids
72-0601
Enzyme activity
72-0601
Toxicity/Experimental Animals
72-0601

Meta-systox
see Demeton methyl

Metasystox R
see Oxydemeton methyl

Metham
see also Carbamates, Fungicides
Integument
72-0550
Morbidity and Mortality Statistics
72-0550
Toxicity/Humans
72-0550

Methidathion
see also Organophosphates
Alternative controls
72-0469
Prevention
72-0469
Residues/Food and Feed
72-0469

Methiocarb
Analysis
72-0180
Blood/Body fluids
72-0180
Digestive System
72-0180
Excretory System
72-0180
Factors Influencing Metabolism/Toxicity
72-0180
Laws and Regulations
72-0243
Metabolism
72-0180
Residues/Food and Feed
72-0243
Residues/Water
72-0243
Toxicity/Humans
72-0243
Toxicity/Wildlife
72-0243

Methomyl
see also Carbamates
Enzyme activity
72-0369

Factors Influencing Metabolism/Toxicity
72-0140
Laws and Regulations
72-0243
Metabolism
72-0140
Nervous System
72-0369
Residue Degradation
72-0140
Residues/Food and Feed
72-0243
Residues/Water
72-0243
Sensory System
72-0369
Toxicity/Humans
72-0243
Toxicity/Wildlife
72-0243 72-0369

Methomyl derived compounds
see also Carbamates
Factors Influencing Metabolism/Toxicity
72-0140
Metabolism
72-0140
Residue Degradation
72-0140

Methoxone
see MCPA

2-(3-Methoxycarbonylthioureido) aniline
see Thiophanate derived compounds

Methoxychlor
Analysis
72-0249 72-0269
72-0390 72-0477
Enzyme activity
72-0576
Metabolism
72-0576
Residue Degradation
72-0249
Residue Removal
72-0475
Residues/Food and Feed
72-0475 72-0477
Residues/Soil
72-0249 72-0483
Residues/Water
72-0062 72-0577
Residues/Wildlife
72-0062 72-0577
Respiratory System
72-0195
Toxicity/Experimetnal Animals
72-0577
Toxicity/Wildlife
72-0195 72-0577

Methyl benzimidazol-2-ylcarbamate
see Thiophanate derived compounds

Methyl Bromide
see also Fumigants
Analysis
72-0647
Digestive System
72-0237
Nervous System
72-0237
Residue/Air
72-0647
Residues/Soil
72-0291
Sensory System
72-0237
Toxicity/Domestic Animals
72-0510
Toxicity/Humans
72-0237 72-0507
72-0510
Treatment of Poisoning
72-0510

Methyl demeton
see also Organophosphates
Analysis
72-0289 72-0376
Enzyme activity
72-0376
Residues/Plants
72-0289
Toxicity/Experimental Animals
72-0376

Methyl ethyl thiophos
see Parathion derived compounds

Methyl eugenol
see also Attractant
Cytological effects
72-0111
Enzyme activity
72-0111
Factors Influencing Metabolism/Toxicity
72-0111
Toxicity/Experimental Animals
72-0111

Methyl mercaptophos
see also Organophosphates
Analysis
72-0208
Cytological effects
72-0203
Toxicity/Experimental Animals
72-0203

Methyl mercury
see Mercurials

N-Methyl-N-(1-naphthyl) monofluoroacetamide
see MNFA

Methyl parathion
see also Organophosphates
Analysis
72-0081 72-0376
72-0390 72-0414
72-0477 72-0548
Blood/Body fluids
72-0548
Enzyme activity
72-0081 72-0369
72-0376
Laws and Regulations
72-0237 72-0243
Metabolism
72-0081 72-0548
Nervous System
72-0369 72-0548
Prevention
72-0509
Residue Degradation
72-0315 72-0548
Residues/Food and Feed
72-0243 72-0315
72-0477
Residues/Humans
72-0548
Residues/Planta
72-0509
Residues/Soil
72-0081
Residues/Water
72-0243
Sensory System
72-0369
Toxicity/Experimental Animals
72-0376
Toxicity/Humans
72-0237 72-0243
72-0509 72-0548
Toxicity/Wildlife
72-0237 72-0243
72-0369

Methylene chloride
see also Fumigants
Analysis
72-0104
Blood/Body fluids
72-0104
Nervous System
72-0104
Residues/Humans
72-0104
Respiratory System
72-0104
Toxicity/Humans
72-0104
Methylenedioxyaniline
Cytological effects
72-0111
Enzyme activity
72-0111
Factors Influencing Metabolism/Toxicity
72-0111
Toxicity/Experimental Animals
72-0111
Methylfluorophosphoric acid isopropyl ester
see Sarin
Methylfluorophosphoric acid pinacolyl ester
see Soman
Methylmercuric dicyandiamide
see Panogen
Metoxuron
see also Herbicides
Residue Degradation
72-0045
Residues/Soil
72-0045
Mevinphos
see also Organophosphates
Analysis
72-0076 72-0215
Digestive System
72-0215
Enzyme activity
72-0165
Factors Influencing Metabolism/Toxicity
72-0165
Laws and Regulations
72-0243
Metabolism
72-0076 72-0215
Morbidity and Mortality Statistics
72-0087
Nervous System
72-0165
Residue Degradation
72-0076
Residue/Soil
72-0076
Residues/Food and Feed
72-0243
Residues/Water
72-0243
Toxicity/Experimental Animals
72-0165 72-0215
Toxicity/Humans
72-0087 72-0243
Toxicity/Wildlife
72-0243
2M-4Kh
see MCPA
MNPA
Biochemical effects
72-0587
Blood/Body fluids
72-0586 72-0587
Cardiovascular System
72-0505 72-0586 72-0587
Digestive System
72-0587
Enzyme activity
72-0586 72-0587
Musculoskeletal System
72-0587
Nervous System
72-0505 72-0587
Respiratory System
72-0505
Toxicity/Experimental Animals
72-0586 72-0587
Toxicity/Humans
72-0505
Toxicity/Wildlife
72-0565
Treatment of Poisoning
72-0565
Moban
see also Carbamates
Analysis
72-0601
Blood/Body fluids
72-0601
Enzyme activity
72-0601
Factors Influencing Metabolism/Toxicity
72-0117
Toxicity/Experimental Animals
72-0117 72-0144 72-0601
Molinate
Analysis
72-0388
Residues/Food and Feed
72-0388
Monitor
Analysis
72-0393
Residues/Food and Feed
72-0393
Monocrotophos
see also Organophosphates
Analysis
72-0207
Enzyme activity
72-0165 72-0369
Factors Influencing Metabolism/Toxicity
72-0117 72-0165
Laws and Regulations
72-0243
Nervous System
72-0165 72-0369
Residues/Food and Feed
72-0243
Residues/Water
72-0243
Sensory System
72-0369
Toxicity/Experimental Animals
72-0117 72-0165
Toxicity/Humans
72-0243
Toxicity/Wildlife
72-0243 72-0369
Monomethyl diuron
Analysis
72-0387
Monomethyl monuron
Analysis
72-0387
Monosodium methanearsonate
see MSMA
Monosodium methylarsonate
see MSMA
Monuron
Analysis
72-0249 72-0398 72-0399
Residue Degradation
72-0249
Residues/Soil
72-0249 72-0398 72-0399

MPMC
see also Carbamates
Analysis
72-0214
MSMA
see also Arsenicals, Herbicides
Analysis
72-0069
Digestive System
72-0602
Factors Influencing Metabolism/Toxicity
72-0069 72-0602
Metabolism
72-0069
Nervous System
72-0602
Prevention
72-0602
Residues/Food and Feed
72-0069
Toxicity/Domestic Animals
72-0602
MTMC
see also Carbamates
Analysis
72-0214
N-2790
see Dyfonate
NAA
see 1-Naphthaleneacetic acid
Nabam
Metabolism
72-0055
Residue Degradation
72-0055
Residues/Food and Feed
72-0055
Naled
Laws and Regulations
72-0243
Residues/Food and Feed
72-0243
Residues/Water
72-0243
Toxicity/Humans
72-0243
Toxicity/Wildlife
72-0243
1-Naphthaleneacetic acid
see also Herbicides
Analysis
72-0462
Factors Influencing Metabolism/Toxicity
72-0462
Photodecomposition
72-0462
Residue Degradation
72-0462
Residues/Food and Feed
72-0462
1-Naphthol
see Carbaryl derived compounds
1-Naphthyldimethylcarbamate
see also Carbamates
Enzyme activity
72-0585
Nervous System
72-0585
Toxicity/Humans
72-0585
Naphthyl glucuronide
see Carbaryl derived compounds
1-Naphthyl N-methylcarbamate
see Carbaryl
Neguvon
see Trichlorfon
Nemacid
Analysis
72-0249
Residue Degradation
72-0249
Residues/Soil
72-0249
Nemacur
see also Organophosphates
Analysis
72-0643
Enzyme Activity
72-0643
Metabolism
72-0643
Residues/Plants
72-0643
Nemagon
see Dibromochloropropane
Nematin
see Metham
Nematocides
see also D-D
Experimental Design
72-0234
Nereistoxin
see Cartap derived compounds
Nissol
see MNFA
p-Nitrophenol
see Parathion derived compounds
Nitrosan
see DNOC
Nogos
Residue Degradation
72-0315
Residues/Food and Feed
72-0315
Norea
see also Herbicides
Analysis
72-0079
Residue Dynamics
72-0079
Residues/Soil
72-0079
Novoxir
see Zineb

Obidoxime
see also Bispyridinium compounds
Blood/Body fluids
72-0119
Enzyme Activity
72-0119
Octachlorodibenzo-p-dioxin
Analysis
72-0396
Omite
Analysis
72-0641
Residues/Food and Feed
72-0641
OMPA
see also Organophosphates
Analysis
72-0376
Enzyme activity
72-0376
Toxicity/Experimental Animals
72-0376
Organochlorines
see also , BHC, BHC isomers, Chlorobenzilate, Chloropropylate, Dicofol, Dieldrin, Dieldrin derived compounds, DDT, DDT derived compounds, DDT isomers, Endosulfan, Endrin, Heptachlor, Lindane, TDE
Endosulfan
72-0465
Analysis
72-0089 72-0409
72-0466 72-0472
72-0473 72-0626
72-0659

Biochemical effects
72-0436 72-0571
Cytological effects
72-0571
Digestive System
72-0472 72-0571
Environmental Pollution
72-0436
Enzyme activity
72-0089 72-0571
Factors Influencing Metabolism/Toxicity
72-0332 72-0436
Laws and Regulations
72-0442
Medicinals
72-0473
Metabolism
72-0436
Mutagenesis/ Teratogenesis
72-0472
Nervous System
72-0332
Prevention
72-0027 72-0442
72-0513
Reproduction/Growth
72-0436 72-0472
Residue Dynamics
72-0027
Residues/Food and Feed
72-0409
Residues/Humans
72-0436
Residues/Plants
72-0027 72-0473
Residues/Soil
72-0027
Residues/Water
72-0027 72-0058
72-0466 72-0472
Residues/Wildlife
72-0409 72-0472
Respiratory System
72-0513
Sensory System
72-0513
Toxicity/Experimental Animals
72-0571
Toxicity/Humans
72-0089 72-0332
72-0472 72-0513
Toxicity/Wildlife
72-0027 72-0472
72-0571

Organofluorides
see Fluenethyl

Organofluorines
Biochemical effects
72-0086
Enzyme activity
72-0086
Morbidity and Mortality Statistics
72-0086
Toxicity/Humans
72-0086

Organophosphates
see also Azinphos methyl, Baytes, Butonate, Chlorfenvinphos, Coumaphos, Crotoxyphos, Crufomate, Daninifos, Dasanit, Demeton, Demeton methyl, Dichlorvos, Dicrotophos, Dimethoate, Dimethoate derived compounds, Disulfoton, Dursban, Dyfonate, DFP, Ethion, EPN, Fenitrothion , Fenthion, Folex, Gardona, Guthion, Kitazin-P, Malathion, Methidathion, Methyl demeton, Methyl mercaptophos, Methyl parathion, Mevinphos, Monocrotophos, Nemacur, O-Ethyl-S-(2-diethylaminoethyl) methylthiophosphonate, O-Ethyl-S-(2-dimethylaminoethyl) methylthiophosphonate, Oxydemeton methyl, OMPA, Parathion, Parathion derived compounds, Phencapton, Phorate, Phosalone, Phosdrin, Ronnel, Sarin, Soman, SD-14045, Tabun, Thionazin, Trichlorfon, Trithion, TEPP, WL-22864
Analysis
72-0085 72-0090
72-0325 72-0580
72-0637 72-0646
72-0650 72-0658
Biochemical effects
72-0085 72-0146
72-0580
Blood/Body Fluids
72-0518
Cardiovascular system
72-0085
Conferences
72-0440
Digestive System
72-0147 72-0514
72-0518 72-0580
Environmental Pollution
72-0501
Enzyme activity
72-0084 72-0136
72-0137 72-0139
72-0143 72-0146
72-0147 72-0194
72-0325 72-0440
72-0552 72-0580
Excretory System
72-0518
Experimental Design
72-0142 72-0194
Factors Influencing Metabolism/Toxicity
72-0084 72-0137
72-0139 72-0142
72-0194 72-0508
Metabolism
72-0142 72-0147
72-0508 72-0580
Musculoskeletal system
72-0090
Nervous System
72-0084 72-0518
72-0522 72-0552
Prevention
72-0085 72-0101
72-0325 72-0440
72-0508 72-0513
72-0514 72-0518
72-0552
Residue Degradation
72-0073 72-0580
Residue/Air
72-0518
Residues/Food and Feed
72-0501 72-0518
Residues/Humans
72-0085
Residues/Plants
72-0650
Residues/Soil
72-0073 72-0501
Residues/Water
72-0658
Respiratory System
72-0088 72-0090
72-0513
Sensory System
72-0084 72-0085
72-0513

Toxicity/Experimental Animals
72-0139 72-0142 72-0143 72-0146 72-0183 72-0194
Toxicity/Humans
72-0084 72-0085 72-0088 72-0090 72-0099 72-0101 72-0102 72-0194 72-0325 72-0440 72-0508 72-0513 72-0514 72-0518 72-0522 72-0552
Treatment of Poisoning
72-0085 72-0088 72-0090 72-0101 72-0102 72-0143 72-0183 72-0440 72-0518 72-0552

Oxycarboxin
see Carboxin derived compounds

Oxydemeton methyl
see also Organophosphates
Factors Influencing Metabolism/Toxicity
72-0117
Toxicity/Experimental Animals
72-0117

1,1'-Oxydimethylene (2-formyl-3-carbamyl-pyridinium chloride)
see HS 6

1,1'-Oxydimethylene bis(3-carbamylpyridinium) chloride
see HS 8

1,1'-Oxydimethylene bispyridinium iodide
see PM2OP

2-PAM
see Pralidoxime

Panogen
see also Fungicides, Mercurials
Digestive System
72-0178
Nervous System
72-0178
Toxicity/Wildlife
72-0178

Paraoxon
see also Parathion derived compounds
Parathion
72-0520

Paraquat
see also Herbicides
Analysis
72-0069 72-0103 72-0217 72-0398 72-0399 72-0572 72-0640
Biochemical Effects
72-0537 72-0619
Blood/Body fluids
72-0103 72-0537 72-0619
Cardiovascular System
72-0537
Conferences
72-0526
Cytological Effects
72-0619
Digestive System
72-0103 72-0319 72-0321 72-0526 72-0537 72-0544
Excretory System
72-0103 72-0319 72-0321 72-0504 72-0526 72-0537 72-0544
Factors Influencing Metabolism/Toxicity
72-0069 72-0526
Metabolism
72-0069 72-0103 72-0217 72-0319 72-0563
Musculoskeletal system
72-0319
Prevention
72-0321 72-0333
Reproduction/Growth
72-0201
Residue Degradation
72-0294
Residue Removal
72-0103
Residues/Food and Feed
72-0069
Residues/Humans
72-0103 72-0217
Residues/Soil
72-0290 72-0398 72-0399 72-0563 72-0640
Residues/Water
72-0061 72-0290 72-0563
Respiratory System
72-0103 72-0321 72-0504 72-0526 72-0537 72-0544 72-0572 72-0619
Toxicity/Experimental Animals
72-0201 72-0619
Toxicity/Humans
72-0103 72-0217 72-0319 72-0321 72-0504 72-0526 72-0537 72-0544
Toxicity/Wildlife
72-0061
Treatment of Poisoning
72-0103 72-0217 72-0319 72-0321 72-0504 72-0526 72-0537 72-0544

Parathion
see also Organophosphates
Alternative controls
72-0242
Analysis
72-0036 72-0138 72-0215 72-0230 72-0249 72-0289 72-0297 72-0337 72-0376 72-0390 72-0404 72-0410 72-0477 72-0503 72-0548 72-0580 72-0632 72-0639 72-0651 72-0657
Biochemical effects
72-0580

Blood/Body fluids
72-0138 72-0181
72-0200 72-0548
72-0554
Digestive System
72-0181 72-0215
72-0370 72-0514
72-0580 72-0651
Enzyme activity
72-0086 72-0108
72-0138 72-0181
72-0200 72-0376
72-0520 72-0528
72-0580
Excretory System
72-0370
Factors Influencing Metabolism/Toxicity
72-0108 72-0117
72-0181 72-0606
Laws and Regulations
72-0243
Metabolism
72-0181 72-0215
72-0520 72-0548
72-0580 72-0606
Morbidity and Mortality Statistics
72-0086 72-0087
Musculoskeletal system
72-0116 72-0138
Nervous System
72-0108 72-0138
72-0181 72-0200
72-0230 72-0520
72-0528 72-0548
Prevention
72-0337 72-0509
72-0514
Reproduction/Growth
72-0344
Residue Degradation
72-0249 72-0548
72-0580
Residues/Food and Feed
72-0036 72-0243
72-0297 72-0410
72-0450 72-0477
Residues/Humans
72-0548 72-0554
72-0651
Residues/Plants
72-0276 72-0289
72-0337 72-0410
72-0509
Residues/Soil
72-0249 72-0410
72-0503
Residues/Water
72-0243
Respiratory System
72-0086
Sensory System
72-0528
Toxicity/Experimental Animals
72-0108 72-0116
72-0117 72-0181
72-0215 72-0344
72-0376 72-0606
72-0610
Toxicity/Humans
72-0086 72-0087
72-0138 72-0243
72-0337 72-0509
72-0512 72-0514
72-0520 72-0528
72-0548 72-0554
Toxicity/Wildlife
72-0200 72-0230
72-0243 72-0370
Treatment of Poisoning
72-0086 72-0520
72-0610
Parathion derived compounds
see also Organophosphates
Paraoxon
Analysis
72-0154 72-0654
Biochemical effects
72-0154
Cytological effects
72-0154
Digestive System
72-0154
Enzyme activity
72-0154
Metabolism
72-0154
Reproduction/Growth
72-0154
PCNC
Analysis
72-0354
Metabolism
72-0354
Residues/Plants
72-0354
PCNB
Analysis
72-0270
PCP
see also Herbicides
Analysis
72-0270 72-0416
Environmental Pollution
72-0240
Factors Influencing Metabolism/Toxicity
72-0159
Nervous System
72-0522
Residues/Domestic Animals
72-0416
Residues/Food and Feed
72-0240
Residues/Humans
72-0240
Residues/Soil
72-0240
Residues/Water
72-0416
Toxicity/Experimental Animals
72-0159 72-0240
Toxicity/Humans
72-0240 72-0522
Toxicity/Wildlife
72-0240
Pebulate
Analysis
72-0388
Residues/Food and Feed
72-0388
Pentachlorophenol
see PCP
Phencapton
see also Organophosphates
Excretory System
72-0128
Factors Influencing Metabolism/Toxicity
72-0128
Toxicity/Experimental Animals
72-0128
Phenmedipham
see also Herbicides
Analysis
72-0026 72-0601
Blood/Body fluids
72-0601
Enzyme activity
72-0601
Residue Degradation
72-0026
Toxicity/Experimental Animals
72-0601
Phenmedipham derived compounds
Analysis
72-0026

Residue Degradation
72-0026

Phenthoate
Laws and Regulations
72-0243
Residues/Food and Feed
72-0243
Residues/Water
72-0243
Toxicity/Humans
72-0243
Toxicity/Wildlife
72-0243

Phenylcarbamates
Analysis
72-0391

Phenylmercuric acetate
see PMA

Phorate
see also Organophosphates
Analysis
72-0076 72-0230
Laws and Regulations
72-0243
Metabolism
72-0076
Nervous System
72-0230
Residue Degradation
72-0073 72-0076
Residue/Soil
72-0076
Residues/Food and Feed
72-0243
Residues/Soil
72-0073
Residues/Water
72-0243
Toxicity/Humans
72-0243
Toxicity/Wildlife
72-0230 72-0243

Phosalone
see also Organophosphates
Analysis
72-0464
Laws and Regulations
72-0243
Residue Degradation
72-0464
Residues/Food and Feed
72-0243 72-0464
Residues/Water
72-0243
Toxicity/Humans
72-0243
Toxicity/Wildlife
72-0243

Phosdrin
see also Organophosphates
Mevinphos
72-0076 72-0087
72-0215
Analysis
72-0376
Enzyme activity
72-0376
Toxicity/Experimental Animals
72-0376

Phosdrine
Prevention
72-0509
Residues/Plants
72-0509
Toxicity/Humans
72-0509

Phosmet
Laws and Regulations
72-0243
Residues/Food and Feed
72-0243
Residues/Water
72-0243
Toxicity/Humans
72-0243
Toxicity/Wildlife
72-0243

Phosphamidon
Alternative controls
72-0242
Analysis
72-0359
Cytological effects
72-0359
Digestive System
72-0359
Laws and Regulations
72-0243
Residues/Food and Feed
72-0243
Residues/Water
72-0243
Toxicity/Experimental Animals
72-0359
Toxicity/Humans
72-0243
Toxicity/Wildlife
72-0243

Phosphine
see also Fumigants
Analysis
72-0647
Residue/Air
72-0647

Photoaldrin
see Aldrin derived compounds

Photodieldrin
see Dieldrin derived compounds

Phorim
Analysis
72-0274
Residues/Food and Feed
72-0274

Picloram
see also Herbicides
Analysis
72-0398 72-0399
72-0400 72-0447
Photodecomposition
72-0285
Prevention
72-0092 72-0333
Residue Degradation
72-0092 72-0294
Residues/Plants
72-0066
Residues/Soil
72-0066 72-0285
72-0398 72-0399
72-0400 72-0447
Residues/Water
72-0066 72-0286
72-0446
Toxicity/Humans
72-0092
Toxicity/Wildlife
72-0285

O-Pinacolyl methylphosphonofluoridate
see Soman

PIPD
see Dieldrin derived compounds

Piperonyl butoxide
see also Synergist
Analysis
72-0154 72-0164
Biochemical effects
72-0154 72-0164
Cytological effects
72-0111 72-0154
Digestive System
72-0154
Enzyme activity
72-0111 72-0154
Factors Influencing Metabolism/Toxicity
72-0111
Metabolism
72-0154

Reproduction/Growth
72-0154
Toxicity/Experimental Animals
72-0111

PHA
Excretory System
72-0569 72-0570
Residue Degradation
72-0294
Toxicity/Experimental Animals
72-0569 72-0570

PHFP
Enzyme activity
72-0361
Musculoskeletal system
72-0361
Nervous System
72-0361
Toxicity/Experimental Animals
72-0361

PHPP
see Soman

PH2OP
see also Bispyridinium compounds
Blood/Body fluids
72-0119
Enzyme Activity
72-0119

PH3P
see also Bispyridinium compounds
Blood/Body fluids
72-0119
Enzyme Activity
72-0119

PHMC
Blood/body fluids
72-0373
Digestive System
72-0373
Enzyme activity
72-0373
Toxicity/Experimental Animals
72-0373

Polycarbazine
Analysis
72-0305
Residues/Food and Feed
72-0305
Residues/Plants
72-0305

Polychlorinated biphenyls
Alternative controls
72-0433
Analysis
72-0063 72-0218
72-0219 72-0229
72-0251 72-0270
72-0280 72-0314
72-0329 72-0366
72-0401 72-0409
72-0465 72-0467
72-0472 72-0482
72-0630 72-0633
72-0635 72-0655
Biochemical effects
72-0366 72-0436
72-0571
Cytological effects
72-0331 72-0366
72-0444
Digestive System
72-0018 72-0366
72-0432 72-0444
72-0472 72-0482
72-0571
Environmental Pollution
72-0432 72-0433
72-0436 72-0444
Enzyme activity
72-0432 72-0444
Factors Influencing Metabolism/Toxicity
72-0436 72-0444
Integument
72-0018
Laws and Regulations
72-0018 72-0432
72-0433
Metabolism
72-0063 72-0198
72-0436
Mutagenesis/ Teratogenesis
72-0331 72-0433
72-0472
Nervous System
72-0189
Photodecomposition
72-0432
Prevention
72-0521
Reproduction/Growth
72-0189 72-0198
72-0320 72-0329
72-0436 72-0444
72-0472
Residue Degradation
72-0521
Residues/Domestic Animals
72-0433
Residues/Food and Feed
72-0018 72-0316
72-0409 72-0432
72-0433 72-0444
Residues/Humans
72-0280 72-0432
72-0436
Residues/Plants
72-0063 72-0467
Residues/Water
72-0063 72-0314
72-0432 72-0465
72-0467 72-0472
72-0633
Residues/Wildlife
72-0198 72-0329
72-0331 72-0409
72-0432 72-0433
72-0444 72-0467
72-0472 72-0482
Toxicity/Experimental Animals
72-0018 72-0571
Toxicity/Humans
72-0018 72-0251
72-0472
Toxicity/Wildlife
72-0018 72-0189
72-0198 72-0251
72-0320 72-0331
72-0366 72-0444
72-0472

Polychlorobenzofurans
Biochemical effects
72-0571
Digestive System
72-0571
Toxicity/Experimental Animals
72-0571

Polychloropinene
Analysis
72-0653
Residues/Food and Feed
72-0653

Pralidoxime
see also Antidotes
Blood/Body fluids
72-0196
Cardiovascular system
72-0196
Metabolism
72-0196
Residues/Humans
72-0196
Sensory System
72-0196
Toxicity/Humans
72 196

Promecarb
see also Carbamates
Analysis
72-0601
Blood/Body fluids
72-0601
Enzyme activity
72-0601
Toxicity/Experimental
Animals
72-0144 72-0601
Prometryne
see also Herbicides
Analysis
72-0079
Factors Influencing
Metabolism/Toxicity
72-0051
Residue Dynamics
72-0079
Residues/Soil
72-0051 72-0079
Propanil
Analysis
72-0354 72-0355
Metabolism
72-0354 72-0355
Residues/Plants
72-0354 72-0355
Prophan
Analysis
72-0399
Residues/Soil
72-0399
Propoxur
see also Carbamates
Analysis
72-0601
Blood/Body fluids
72-0601
Enzyme activity
72-0601
Factors Influencing
Metabolism/Toxicity
72-0117 72-0140
Metabolism
72-0140
Residue Degradation
72-0140
Toxicity/Experimental
Animals
72-0117 72-0144
72-0601
Propoxur derived compounds
see also Carbamates
Factors Influencing
Metabolism/Toxicity
72-0140
Metabolism
72-0140
Residue Degradation
72-0140
Toxicity/Experimental
Animals
72-0144
Propylene oxide
Toxicity/Experimental
Animals
72-0184
Treatment of Poisoning
72-0184
Przedziorkofos
see Phencapton
PTHD
see Danifos
Pyrazon
Analysis
72-0317 72-0354
72-0355
Metabolism
72-0354 72-0355
Residues/Food and Feed
72-0317
Residues/Plants
72-0317 72-0354
72-0355
Pyrethrins
see also Botanicals
Analysis
72-0149 72-0652
Metabolism
72-0149
Nervous System
72-0148
Toxicity/Experimental
Animals
72-0148
Toxicity/Wildlife
72-0253
Pyrethroids
see Pyrethrins
Pyrethrum
Alternative controls
72-0242
Laws and Regulations
72-0243
Residues/Food and Feed
72-0243
Residues/Water
72-0243
Toxicity/Humans
72-0243
Toxicity/Wildlife
72-0243
Pyrolan
see also Carbamates
Analysis
72-0601
Blood/Body fluids
72-0601
Enzyme activity
72-0601
Toxicity/Experimental
Animals
72-0601
Quaternary ammonium compounds
Enzyme activity
72-0133
Factors Influencing
Metabolism/Toxicity
72-0133
Toxicity/Experimental
Animals
72-0133
Resmethrin
Analysis
72-0420
Spectrometry
72-0420
Rodenticides
see also Coumatetralyl, Fluoroacetamide, Sodium fluoroacetate, Strychnine, Thallium, Warfarin Dicumarol Zinc phosphide
72-0168
Rogor
see Dimethoate
Ronnel
see also Organophosphates
Analysis
72-0376 72-0411
Enzyme activity
72-0376
Residues/Domestic
Animals
72-0411
Toxicity/Experimental
Animals
72-0376
Rotenolone
see Rotenone derived compounds
Rotenone
Laws and Regulations
72-0243
Residues/Food and Feed
72-0243
Residues/Water
72-0243
Respiratory System
72-0195
Toxicity/Humans
72-0243

Toxicity/Wildlife
72-0195 72-0243
Rotenone derived compounds
Enzyme Activity
72-0123
Metabolism
72-0123
Toxicity/Experimental Animals
72-0123
Ruelene
see Crufonate

Safrole
Cytological effects
72-0111
Enzyme activity
72-0111
Factors Influencing Metabolism/Toxicity
72-0111
Toxicity/Experimental Animals
72-0111
Sarin
see also Organophosphates
Analysis
72-0618
Nervous System
72-0618
Respiratory System
72-0618
Toxicity/Experimental Animals
72-0610 72-0618
Treatment of Poisoning
72-0610

Sayfos
see Menazon
Schradan
Laws and Regulations
72-0237
Toxicity/Humans
72-0237
Toxicity/Wildlife
72-0237
SD-14045
see also Organophosphates
Enzyme activity
72-0165
Factors Influencing Metabolism/Toxicity
72-0165
Nervous System
72-0165
Toxicity/Experimental Animals
72-0165

Sevin
see Carbaryl
Siduron
Analysis
72-0387
Silvex
see also Herbicides
Prevention
72-0092
Residue Degradation
72-0092
Toxicity/Humans
72-0092
Simazine
see also Herbicides
Analysis
72-0399
Reproduction/Growth
72-0201
Residue Degradation
72-0049
Residue Dynamics
72-0049 72-0067
Residues/Soil
72-0049 72-0067
72-0399
Toxicity/Experimental Animals
72-0201
Sodium arsenite
Laws and Regulations
72-0237
Toxicity/Humans
72-0237
Toxicity/Wildlife
72-0237

Sodium chlorate
see also Herbicides
Biochemical effects
72-0134
Blood/Body fluids
72-0134 72-0535
Cytological Effects
72-0535
Excretory System
72-0134
Metabolism
72-0134 72-0535
Prevention
72-0535
Toxicity/Domestic Animals
72-0535
Toxicity/Experimental Animals
72-0134

Sodium fluoroacetate
see also Rodenticides
Factors Influencing Metabolism/Toxicity
72-0025 72-0117
Toxicity/Experimental Animals
72-0117
Toxicity/Wildlife
72-0025
Sodium p-(dimethylamino) benzenediazosulfonate
see Dexon
Sodium Fluoride
Musculoskeletal system
72-0204
Toxicity/Experimental Animals
72-0204
Soldep
see Trichlorfon
Soman
see also Organophosphates
Analysis
72-0221
Cardiovascular System
72-0590
Enzyme activity
72-0145 72-0375
72-0585 72-0590
Metabolism
72-0046
Musculoskeletal System
72-0590
Nervous System
72-0145 72-0585
72-0590
Residue Degradation
72-0046
Residues/Plants
72-0046
Respiratory System
72-0590
Toxicity/Experimental Animals
72-0145 72-0590
72-0610 72-0620
Toxicity/Humans
72-0585
Treatment of Poisoning
72-0145 72-0610
72-0620
Strychnine
see also Rodenticides
Analysis
72-0645
Digestive System
72-0645
Factors Influencing Metabolism/Toxicity
72-0117

Morbidity and Mortality Statistics
72-0087
Toxicity/Domestic Animals
72-0645
Toxicity/Experimental Animals
72-0117
Toxicity/Humans
72-0087
Succinic acid mono(2,2-dimethylhydrazide)
see Aminozide
Supona
see Chlorfenvinphos
Synergists
see also Piperonyl butoxide
Systox
see Demeton
2,4,5-T
see also Herbicides
Analysis
72-0249 72-0282
72-0415 72-0582
72-0630
Beneficial Effects
72-0001
Carcinogenesis
72-0252
Digestive System
72-0602
Environmental Pollution
72-0252 72-0424
Enzyme activity
72-0083
Experimental Design
72-0431
Factors Influencing Metabolism/Toxicity
72-0083 72-0345
72-0602
Laws and Regulations
72-0345 72-0424
Metabolism
72-0582
Musculoskeletal system
72-0345
Mutagenesis/ Teratogenesis
72-0345 72-0431
72-0617
Nervous System
72-0602
Photodecomposition
72-0285
Prevention
72-0092 72-0333
72-0602
Reproduction/Growth
72-0130 72-0617
Residue Degradation
72-0092 72-0249
72-0294
Residues/Food and Feed
72-0252 72-0282
Residues/Human
72-0083
Residues/Soil
72-0249 72-0285
Residues/Water
72-0252 72-0446
Toxicity/Domestic Animals
72-0602
Toxicity/Experimental Animals
72-0130 72-0345
72-0431
Toxicity/Humans
72-0083 72-0092
72-0252 72-0431
Toxicity/Wildlife
72-0252 72-0285
2,4,5-T esters
see also Herbicides
Analysis
72-0477
Residues/Food and Feed
72-0477
Tabun
see also Organophosphates
Toxicity/Experimental Animals
72-0610
Treatment of Poisoning
72-0610
TCDD
Residues/Food and Feed
72-0273
Residues/Plants
72-0273
Residues/Soil
72-0273
TDE
see also Organochlorines
Analysis
72-0218 72-0249
72-0255 72-0256
72-0258 72-0259
72-0260 72-0261
72-0262 72-0264
72-0265 72-0266
72-0268 72-0269
72-0300 72-0402
72-0403 72-0421
72-0477 72-0485
72-0578 72-0655
Biochemical effects
72-0131 72-0169
Blood/Body fluids
72-0578
Carcinogenesis
72-0132
Cytological effects
72-0376
Digestive System
72-0131 72-0169
72-0308 72-0578
Endocrine system
72-0131 72-0169
Enzyme activity
72-0376 72-0576
Excretory System
72-0376
Factors Influencing Metabolism/Toxicity
72-0132 72-0578
Laws and Regulations
72-0243 72-0244
Metabolism
72-0177 72-0192
72-0198 72-0576
72-0578
Musculoskeletal system
72-0376
Nervous System
72-0169 72-0308
72-0376
Prevention
72-0244
Reproduction/Growth
72-0131 72-0198
72-0308
Residue Degradation
72-0192 72-0249
72-0300 72-0485
72-0578
Residue Removal
72-0283 72-0475
72-0485
Residues/Food and Feed
72-0243 72-0256
72-0264 72-0283
72-0475 72-0477
Residues/Humans
72-0283
Residues/Plants
72-0132 72-0264
Residues/Soil
72-0249 72-0256
72-0260 72-0261
72-0262 72-0264
Residues/Water
72-0062 72-0243
72-0266 72-0268
72-0455

Residues/Wildlife
72-0062 72-0198
72-0255 72-0258
72-0259 72-0260
72-0261 72-0265
72-0266 72-0308
72-0455
Sensory System
72-0131
Therapeutic use
72-0131
Toxicity/Domestic Animals
72-0244
Toxicity/Experimental Animals
72-0132 72-0169
72-0177 72-0192
Toxicity/Humans
72-0131 72-0243
72-0244
Toxicity/Wildlife
72-0198 72-0243
72-0244 72-0376

TEPA
Musculoskeletal system
72-0371
Toxicity/Experimental Animals
72-0371

TEPP
see also Organophosphates
Enzyme activity
72-0585
Laws and Regulations
72-0243
Nervous System
72-0585
Residues/Food and Feed
72-0243
Residues/Water
72-0243
Toxicity/Humans
72-0243 72-0585
Toxicity/Wildlife
72-0243

Terbacil
see also Herbicides
Analysis
72-0079 72-0468
72-0634
Residue Dynamics
72-0079
Residues/Soil
72-0079 72-0468
72-0634
Residues/Water
72-0634

Tetradifon
Analysis
72-0263
Residues/Soil
72-0263

2,3,7,8-Tetrachlorodibenzo-p-dioxin
Analysis
72-0395 72-0396

TFM
Analysis
72-0605
Metabolism
72-0605

TFM derived compounds
Analysis
72-0605
Metabolism
72-0605

Thallium
see also Rodenticide, Rodenticides
Digestive System
72-0553
Excretory System
72-0553
Factors Influencing Metabolism/Toxicity
72-0025
Integument
72-0553
Musculoskeletal System
72-0553
Nervous System
72-0597
Sensory System
72-0553
Toxicity/Domestic Animals
72-0553
Toxicity/Experimental Animals
72-0597
Toxicity/Wildlife
72-0025
Treatment of Poisoning
72-0553 72-0556

Thiabendazole
see also Fungicides
Analysis
72-0216
Digestive System
72-0155
Endocrine system
72-0155
Residues/Plants
72-0216
Residues/Soil
72-0216
Toxicity/Experimental Animals
72-0155

Thinet
see Phorate

Thiodan
see Endosulfan

Thiometon
Laws and Regulations
72-0243
Metabolism
72-0563
Residues/Food and Feed
72-0243
Residues/Soil
72-0563
Residues/Water
72-0243 72-0563
Toxicity/Humans
72-0243
Toxicity/Wildlife
72-0243

Thionazin
see also Organophosphates
Factors Influencing Metabolism/Toxicity
72-0078
Laws and Regulations
72-0243
Residue Degradation
72-0078
Residue Dynamics
72-0077
Residues/Food and Feed
72-0243
Residues/Soil
72-0077 72-0078
Residues/Water
72-0243
Toxicity/Humans
72-0243
Toxicity/Wildlife
72-0243

Thiophanate
see also Fungicides
Metabolism
72-0112

Thiophanate derived compounds
see also Fungicides
Metabolism
72-0112

Thiophanate-methyl
see also Fungicides
Metabolism
72-0112

Thiophosgene
see Folpet derived compounds
Thiram
Factors Influencing Metabolism/Toxicity
72-0159
Toxicity/Experimental Animals
72-0159
Thiram
Analysis
72-0289
Residues/Plants
72-0289
THB4
see also Bispyridinium compounds
Blood/Body fluids
72-0119
Enzyme Activity
72-0119
THPD
Cardiovascular system
72-0353
Cytological effects
72-0353
Enzyme activity
72-0353
Toxicity/Domestic Animals
72-0353
THTD
Digestive System
72-0519
Enzyme Activity
72-0519
Excretory System
72-0519
Integument
72-0519
Nervous System
72-0519
Residues/Food and Feed
72-0519
Toxicity/Humans
72-0519
m-Tolyl N-methylcarbamate
see MTMC
Topsin
Analysis
72-0212
Torak
Analysis
72-0271
Residues/Food and Feed
72-0271
Tordon 225
see Picloram
Toxaphene
Analysis
72-0249 72-0263
72-0296 72-0410
Cytological Effects
72-0614
Digestive System
72-0370
Enzyme Activity
72-0614
Excretory System
72-0370
Residue Degradation
72-0249
Residues/Food and Feed
72-0410
Residues/Plants
72-0410
Residues/Soil
72-0249 72-0263
72-0296 72-0410
Residues/Water
72-0062
Residues/Wildlife
72-0062
Toxicity/Wildlife
72-0370
Toxogonin
see Obidoxime
Triallate
see also Carbamates, Herbicides
Analysis
72-0052 72-0303
Residue Dynamics
72-0052
Residues/Soil
72-0052 72-0303
S-(2,3,3-Trichloroallyl) diisopropylthiocarbamate
see Triallate
Trichlorfon
see also Organophosphates
Alternative controls
72-0469
Analysis
72-0476 72-0502
Biochemical Effects
72-0543
Digestive System
72-0349 72-0543
Enzyme activity
72-0349 72-0547
Factors Influencing Metabolism/Toxicity
72-0047 72-0543
72-0547
Laws and Regulations
72-0243
Metabolism
72-0047 72-0563
Musculoskeletal System
72-0547
Nervous System
72-0543 72-0547
Photodecomposition
72-0502
Prevention
72-0469 72-0543
72-0547
Residue Degradation
72-0047
Residues/Domestic Animals
72-0047
Residues/Food and Feed
72-0243 72-0469
72-0476
Residues/Soil
72-0563
Residues/Water
72-0243 72-0563
Sensory System
72-0543 72-0547
Toxicity/Domestic Animals
72-0453
Toxicity/Experimental Animals
72-0349
Toxicity/Humans
72-0243 72-0543
72-0547
Toxicity/Wildlife
72-0243
Treatment of Poisoning
72-0543 72-0547
2,3,7-Trichlorodibenzo-p-dioxin
Analysis
72-0395
Trichloronate
Laws and Regulations
72-0243
Residues/Food and Feed
72-0243
Residues/Water
72-0243
Toxicity/Humans
72-0243
Toxicity/Wildlife
72-0243
Tridemorph
see also Fungicide

Analysis
72-0479
Metabolism
72-0479
Residues/Food and Feed
72-0479

3-Trifluoromethyl-4-aminophenol
see TFM derived compounds

3-Trifluoromethyl-4-nitrophenol
see TFM

Trifluralin
Analysis
72-0228 72-0356
Prevention
72-0333
Residue Degradation
72-0294
Residues/Soil
72-0228
Residues/Water
72-0286
Spectrometry
72-0356

1,1'-Trimethylene bis(4-formylpyridinium bromide) dioxime
see TMB4

1,1'-Trimethylene bispyridinium iodide
see PM3P

Trimethylphosphate
Musculoskeletal system
72-0371
Toxicity/Experimental Animals
72-0371

1,2,2-Trimethylpropyl Methylphosphono-fluoridate
see Soman

Trithion
see also Organophosphates
Analysis
72-0376
Enzyme activity
72-0376
Toxicity/Experimental Animals
72-0376

Tsumacide
see MTMC

UC-34096
Analysis
72-0357
Metabolism
72-0357
Respiratory System
72-0357

Undeen
see Propoxur

Urea compounds
see Herbicides

Vanillylamine
Cytological effects
72-0111
Enzyme activity
72-0111
Factors Influencing Metabolism/Toxicity
72-0111
Toxicity/Experimental Animals
72-0111

Vapam
see Metham

Vapona
see Dichlorvos

Vernam
see Vernolate

Vernolate
see also Herbicides
Analysis
72-0388
Prevention
72-0333
Residue Degradation
72-0294
Residues/Food and Feed
72-0388

Warfarin
see also Rodenticides
Morbidity and Mortality Statistics
72-0087
Toxicity/Domestic Animals
72-0429
Toxicity/Experimental Animals
72-0429
Toxicity/Humans
72-0087 72-0429

Weedol
see Paraquat

WL-19805
see also Herbicides
Reproduction/Growth
72-0201
Toxicity/Experimental Animals
72-0201

WL-22864
see also Organophosphates
Enzyme activity
72-0165
Factors Influencing Metabolism/Toxicity
72-0165
Nervous System
72-0165
Toxicity/Experimental Animals
72-0165

Wofatox
see Methyl parathion

Xylene
Toxicity/Humans
72-0091

3,4-Xylyl N-methylcarbamate
see MPMC

Zeazin
see Atrazine

Zectran
see also Carbamates
Analysis
72-0180 72-0601
Blood/Body fluids
72-0180 72-0601
Digestive System
72-0180
Enzyme activity
72-0601
Excretory System
72-0180
Factors Influencing Metabolism/Toxicity
72-0059 72-0117 72-0180
Metabolism
72-0059 72-0180
Residues/Soil
72-0059
Toxicity/Experimental Animals
72-0117 72-0601

Zinc phosphide
see also Rodenticide
Factors Influencing Metabolism/Toxicity
72-0025
Laws and Regulations
72-0237
Toxicity/Humans
72-0237
Toxicity/Wildlife
72-0025 72-0237

Zineb
Analysis
72-0305 72-0389
Carcinogenesis
72-0193
Cytological Effects
72-0558
Endocrine System
72-0558
Factors Influencing Metabolism/Toxicity
72-0545
Immunology
72-0545
Integument
72-0193 72-0545
Metabolism
72-0055 72-0563
Prevention
72-0333 72-0545
Reproduction/Growth
72-0193
Residue Degradation
72-0055 72-0294
Residues/Food and Feed
72-0055 72-0305
72-0389
Residues/Plants
72-0305 72-0545
Residues/Soil
72-0563
Residues/Water
72-0563
Respiratory System
72-0193
Toxicity/Experimental Animals
72-0193 72-0558
Toxicity/Humans
72-0545
Treatment of Poisoning
72-0545

Zinophos
see Thionazin

Alternative controls
72-0250 72-0434
Azinphosethyl
72-0469
Carbamates
72-0242
Carbaryl
72-0242 72-0469
2,4-D
72-0238
DDT
72-0242 72-0433
Diazinon
72-0242 72-0469
Dieldrin
72-0242
Dimethoate
72-0242 72-0469
Endosulfan
72-0242
Endrin
72-0242
Heptachlor
72-0242
Lead arsenate
72-0242
Lindane
72-0242
Malathion
72-0242
Maldison
72-0469
Menazon
72-0242
Methidathion
72-0469
Parathion
72-0242
Phosphamidon
72-0242
Polychlorinated
biphenyls
72-0433
Pyrethrum
72-0242
Trichlorphon
72-0469
Analysis
General
72-0035
Aldrin
72-0390 72-0402
Aminozide
72-0209
BHC
72-0390
Chloroxuron
72-0387
Dacthal
72-0390
DDT
72-0390 72-0402
72-0638
DDT derived
compounds
72-0390 72-0402
72-0638 72-0656
DDT isomers
72-0390
Di-syston
72-0390
Dieldrin
72-0402 72-0638
72-0656
Dithane M-22
72-0389
Diuron
72-0387
Endosulfan
72-0390 72-0402
Ethion
72-0390
Fenuron
72-0387
Heptachlor
72-0402
Heptachlor epoxide
72-0638
Lindane
72-0638
Linuron
72-0387
Maneb
72-0389
Methoxychlor
72-0390
Methyl mercaptophos
72-0208
Methyl parathion
72-0390
Monomethyl diuron
72-0387
Monomethyl monuron
72-0387
Organochlorines
72-0089 72-0385
72-0409 72-0472
72-0659
Parathion
72-0390
Polychlorinated
biphenyls
72-0251 72-0401
72-0409 72-0472
Siduron
72-0387
TDE
72-0402
Zineb
72-0389
Bioassay
72-0445
Acrylonitrile
72-0647
Aldrin
72-0410
Ametryne
72-0079
Amitrole
72-0632
Azinphosmethyl
72-0410
BHC
72-0410
Carbaryl
72-0594
Carbon disulfide
72-0647
Carbon tetrachloride
72-0647
Chlordane
72-0410
Chloropicrin
72-0647
Cycloate
72-0317
2,4-D
72-0412
DDT
72-0410 72-0412
72-0467 72-0599
DDT derived
compounds
72-0599 72-0632
Delachlor
72-0317
Demphion
72-0414
Diallate
72-0317
Diazinon
72-0410
Difolatan
72-0318
Dimethoate
72-0410
Dinoseb
72-0172
Diuron
72-0079
Endothall
72-0317
Ethylene dibromide
72-0647
Ethylene dichloride
72-0647
Ethylene oxide
72-0647
Fluometuron
72-0079

Heptachlor epoxide
72-0410
Lindane
72-0410 72-0412
Linuron
72-0172
Malathion
72-0410 72-0412
72-0632
Methyl bromide
72-0647
Methyl Parathion
72-0414
Norea
72-0079
Parathion
72-0410 72-0632
Phosphine
72-0647
Picloram
72-0447
Polychlorinated
biphenyls
72-0467
Prometryne
72-0079
Pyrazon
72-0317
Strychnine
72-0645
Terbacil
72-0079 72-0634
Thiabendazole
72-0216
Torak
72-0271
Toxaphene
72-0410
Trifluralin
72-0228
Cholinesterase/Enzyme
72-0222 72-0624
Aldrin
72-0262
Aminocarb
72-0601
Azinphosmethyl
72-0230 72-0376
Banol
72-0601
Butonate
72-0476
Bux
72-0601
Carbamates
72-0650
Carbaryl
72-0601 72-0648
dane
72-0262
Chlorfenvinphos
72-0113
Coumaphos
72-0376
Dasanit
72-0376
DDT
72-0262
DDT derived
compounds
72-0262
Delnav
72-0376
Demeton
72-0376
Diazinon
72-0230
Dichlorvos
72-0476
Dicofol
72-0262
Dieldrin
72-0262
Dimethoate
72-0376
Dimetan
72-0601
Dimetilan
72-0601
Disulfoton
72-0376
Endosulfan
72-0262
Endrin
72-0262
EPN
72-0376
Ethion
72-0376
Fenthion
72-0354 72-0376
Folex
72-0376
Formetanate
72-0601
GS-15171
72-0601
Heptachlor
72-0262
Heptachlor epoxide
72-0262
Insecticides
72-0003
Isolane
72-0601
Lindane
72-0262
Malathion
72-0090
Mesurol
72-0601
Methyl demeton
72-0376
Methyl parathion
72-0376 72-0548
Mobam
72-0601
OMPA
72-0376
Organophosphates
72-0085 72-0090
72-0325 72-0637
72-0650
Paraoxon
72-0221
Parathion
72-0138 72-0230
72-0337 72-0376
72-0548
Phenmedipham
72-0601
Phorate
72-0230
Phosdrin
72-0376
Promecarb
72-0601
Propoxur
72-0601
Pyrolan
72-0601
Ronnel
72-0376
Sarin
72-0618
Soman
72-0221
TDE
72-0262
Trichlorfon
72-0476
Trithion
72-0376
Zectran
72-0601
Chromatography
General
Methylene chloride
72-0104
Parathion derived
compounds
72-0654
Adsorption
BHC
72-0404
DDT
72-0404
Diazinon
72-0404

Dieldrin
72-0404
Heptachlor
72-0404
Malathion
72-0404
Parathion
72-0404
Polychlorinated biphenyls
72-0219
Topsin
72-0212
Column
p-Chlorophenyl N-methylcarbamate
72-0581
Aldrin
72-0218 72-0477
BHC
72-0649
BHC isomers
72-0473
2,4-D esters
72-0477
DDT
72-0218 72-0474
72-0655
DDT derived compounds
72-0218 72-0329
72-0474 72-0477
72-0655
DDT isomers
72-0473 72-0477
2,3-Dichlorodibenzo-p-dioxin
72-0395
Dieldrin
72-0218 72-0473
72-0474 72-0477
Endrin
72-0477
Fenitrothion
72-0075
Heptachlor
72-0218 72-0474
72-0477
Heptachlor epoxide
72-0218 72-0473
72-0474 72-0477
Hexachlorobenzene
72-0218
Lindane
72-0218 72-0477
72-0649
Methoxychlor
72-0477
Methyl parathion
72-0477
Organochlorines
72-0473
Parathion
72-0477
Polychlorinated biphenyls
72-0218 72-0401
72-0655
2,4,5-T esters
72-0477
TDE
72-0218 72-0477
72-0655
2,3,7,8-Tetrachlorodibenzo-p-dioxin
72-0395
2,3,7-Trichlorodibenzo-p-dioxin
72-0395
Electrophoresis
Chlorfenvinphos
72-0113
Famphur
72-0580
Folpet
72-0120
Folpet derived compounds
72-0120
Malathion
72-0580
Organophosphates
72-0580
Paraoxon
72-0173
Parathion
72-0580
Gas-liquid
72-0220 72-0407
72-0622 72-0625
Aldicarb
72-0289
Aldrin
72-0036 72-0249
72-0256 72-0262
72-0263 72-0269
72-0303 72-0352
72-0451 72-0477
72-0631 72-0657
Allethrin
72-0224
Allethrin derived compounds
72-0224
Atrazine
72-0249 72-0392
Azinphosmethyl
72-0215
BHC
72-0213 72-0302
72-0365 72-0403
72-0451 72-0557
72-0649
BHC isomers
72-0473
Bromides
72-0036
Butylate
72-0388
Carbofuran
72-0386
Carbaryl
72-0036 72-0249
Chlordane
72-0249 72-0262
72-0263 72-0269
72-0302 72-0461
72-0623
Chlorobenzilate
72-0470
p-Chlorophenyl N-methylcarbamate
72-0581
Chloropropylate
72-0470
Chlorpropham
72-0388
Conen
72-0210
Crotoxyphos
72-0080
Cycloate
72-0388
2,4-D
72-0249 72-0275
72-0630
2,4-D esters
72-0477
DCP
72-0310
D-D
72-0383
DDT
72-0036 72-0213
72-0249 72-0255
72-0256 72-0258
72-0259 72-0260
72-0261 72-0262
72-0263 72-0264
72-0265 72-0266
72-0268 72-0269
72-0278 72-0279
72-0281 72-0296
72-0300 72-0302
72-0303 72-0307
72-0365 72-0403
72-0451 72-0459
72-0465 72-0474

72-0478 72-0482
72-0485 72-0557
72-0630 72-0638
72-0657
DDT derived compounds
72-0063 72-0249
72-0255 72-0256
72-0258 72-0259
72-0260 72-0261
72-0262 72-0264
72-0265 72-0266
72-0268 72-0279
72-0302 72-0303
72-0351 72-0365
72-0403 72-0465
72-0474 72-0477
72-0478 72-0482
72-0557 72-0638
DDT isomers
72-0261 72-0266
72-0279 72-0302
72-0303 72-0365
72-0473 72-0477
Demeton methyl
72-0215
Diallate
72-0388
Diazinon
72-0249 72-0639
Dichlormate
72-0388
Dichloromethane
72-0413
Dichlorvos
72-0036 72-0382
Dichlorzoline
72-0418
Dicofol
72-0036 72-0262
72-0263
Dieldrin
72-0036 72-0213
72-0249 72-0255
72-0256 72-0257
72-0259 72-0260
72-0261 72-0262
72-0263 72-0266
72-0267 72-0269
72-0278 72-0303
72-0352 72-0365
72-0403 72-0473
72-0474 72-0477
72-0482 72-0485
72-0557 72-0631
72-0638 72-0644
Diethion
72-0289
Dimethoate
72-0215 72-0289
Disulfoton
72-0211 72-0272
Diuron
72-0249
Dyrene
72-0657
Endosulfan
72-0262 72-0263
72-0465 72-0480
72-0538
Endosulfan derived compounds
72-0480
Endrin
72-0036 72-0262
72-0263 72-0269
72-0403 72-0477
72-0485 72-0644
EPTC
72-0388
Ethylene thiourea
72-0301
Fenitrothion
72-0029 72-0075
Fenthion
72-0211 72-0639
Gardona
72-0360
Heptachlor
72-0036 72-0176
72-0249 72-0256
72-0262 72-0263
72-0269 72-0352
72-0461 72-0474
72-0477 72-0485
Heptachlor epoxide
72-0176 72-0256
72-0260 72-0262
72-0263 72-0278
72-0461 72-0473
72-0474 72-0477
72-0638
Hinosan
72-0211
Ipronidazole
72-0381
Isodrin
72-0352
Lindane
72-0036 72-0063
72-0249 72-0256
72-0257 72-0262
72-0263 72-0289
72-0303 72-0465
72-0477 72-0485
72-0638 72-0649
Lovozal
72-0405
Malathion
72-0036 72-0215
72-0249 72-0289
72-0639 72-0657
Maneb
72-0289 72-0301
Mercury
72-0451
Methoxychlor
72-0249 72-0269
72-0477
Methyl demeton
72-0289
Methyl parathion
72-0477
Mevinphos
72-0076 72-0215
Molinate
72-0388
Monitor
72-0393
Monuron
72-0249
Nemacid
72-0249
Octachlorodibenzo-p-dioxin
72-0396
Omite
72-0641
Organochlorines
72-0466 72-0473
72-0659
Parathion
72-0036 72-0215
72-0249 72-0289
72-0297 72-0477
72-0639 72-0657
PCNB
72-0270
PCP
72-0270 72-0416
Pebulate
72-0388
Phorate
72-0076
Phosalone
72-0464
Phoxim
72-0274
Polychlorinated biphenyls
72-0063 72-0219
72-0229 72-0270
72-0280 72-0314
72-0366 72-0401
72-0465 72-0482
72-0630 72-0633
72-0635
Pyrethrins
72-0652
Resmethrin
72-0420

Ronnel
72-0411
2,4,5-T
72-0249 72-0415
72-0582 72-0630
2,4,5-T esters
72-0477
TDE
72-0249 72-0255
72-0256 72-0258
72-0259 72-0260
72-0261 72-0262
72-0264 72-0265
72-0266 72-0268
72-0269 72-0300
72-0403 72-0477
72-0485
Temik
72-0289
2,3,7,8-Tetrachlorodibenzo-p-dioxin
72-0396
Tetradifon
72-0263
Thiran
72-0289
Toxaphen
72-0249
Toxaphene
72-0263 72-0296
Triallate
72-0052 72-0303
Trifluralin
72-0228 72-0356
Vernolate
72-0388
Ion-exchange
Carbaryl
72-0503
Malathion
72-0106
Paraquat
72-0217
Parathion
72-0503
Liquid-liquid
Baytex
72-0639
Diazinon
72-0639
Malathion
72-0639
Parathion
72-0639
Paper
72-0629
Aldrin
72-0631
Dieldrin
72-0631
Methyl mercaptophos
72-0208
Plasma
Polychlorinated biphenyls
72-0635
Soil Thin-layer
Atrazine
72-0399
Chloropropham
72-0399
2,4-D
72-0399
Dicamba
72-0399
Diphenamid
72-0399
Diquat
72-0399
Diuron
72-0399
Fenac
72-0399
Monuron
72-0399
Paraquat
72-0399
Picloram
72-0399
Propham
72-0399
Simazine
72-0399
Thin-layer
72-0627 72-0629
Acrex
72-0406
Aldicarb
72-0289 72-0463
Aldicarb derived compounds
72-0463
Aldrin
72-0036 72-0256
72-0263 72-0631
Amiben
72-0398
Amitrole
72-0354
Atrazine
72-0398
Azinphosmethyl
72-0215 72-0398
Banol
72-0357
BAS 3191
72-0460
BHC
72-0302 72-0421
Bromides
72-0036
Butonate
72-0476
Captan
72-0421
Carbaryl
72-0036 72-0354
72-0355 72-0357
72-0456
Carbofuran
72-0354
Chloramben
72-0354
Chlordane
72-0263 72-0302
72-0623
Chlorfenvinphos
72-0354
Chlorobenzilate
72-0470
Chlorpropham
72-0354 72-0355
Chloropropylate
72-0470
2,4-D
72-0380 72-0398
72-0400 72-0417
2,4-DB
72-0354 72-0380
DDT
72-0036 72-0256
72-0263 72-0268
72-0302 72-0421
72-0578 72-0653
DDT derived compounds
72-0256 72-0268
72-0302 72-0421
72-0578 72-0653
DDT isomers
72-0302
Demeton methyl
72-0215
Diazinon
72-0471
Diazinon analogs and metabolites
72-0471
Dicamba
72-0354 72-0355
72-0380 72-0398
72-0400
Dichlorvos
72-0036 72-0476
Dicofol
72-0036 72-0263

Dieldrin
72-0036 72-0256
72-0263 72-0358
72-0631
Diethion
72-0289 72-0644
Difolatan
72-0318 72-0515
Dimethoate
72-0215 72-0289
72-0419
Dinoseb
72-0406
Diphenamid
72-0398
Disulfoton
72-0211 72-0354
DNBP
72-0380
DNOC
72-0380
n-Dodecylguanidine acetate
72-0227
Dyfonate
72-0354 72-0355
Endosulfan
72-0263
Endrin
72-0036 72-0263
72-0644
Fenac
72-0398 72-0400
Fensulfothion
72-0354
Fenthion
72-0211
Fluenethyl
72-0642
Heptachlor
72-0036 72-0256
72-0263 72-0653
Heptachlor epoxide
72-0256 72-0263
Hinosan
72-0211
Karatan
72-0406
Kerb
72-0354 72-0355
Lindane
72-0036 72-0256
72-0263 72-0289
72-0421
Linuron
72-0354 72-0355
Malathion
72-0036 72-0215
72-0289 72-0355
Maneb
72-0289
MCP
72-0282
MCPP
72-0380
Methocarb
72-0180
Methyl demeton
72-0289
Methyl mercaptophos
72-0208
Mevinphos
72-0215
Monuron
72-0398
MPMC
72-0214
MTMC
72-0214
Nemacur
72-0643
Octachlorodibenzo-p-dioxin
72-0396
Organochlorines
72-0659
Organophosphates
72-0658
Paraquat
72-0398
Parathion
72-0036 72-0215
72-0289 72-0651
PCMC
72-0354
Phenmedipham
72-0026
Phenmedipham derived compounds
72-0026
Phosphamidon
72-0359
Picloram
72-0398 72-0400
Polycarbazine
72-0305
Polychlorinated biphenyls
72-0329
Polychloropinene
72-0653
Propanil
72-0354 72-0355
Pyrazon
72-0354 72-0355
Resmethrin
72-0420
2,4,5-T
72-0282
TDE
72-0256 72-0268
72-0578
Temik
72-0289
2,3,7,8-Tetrachlorodibenzo-p-dioxin
72-0396
Tetradifon
72-0263
Thiram
72-0289
Toxaphene
72-0263
Trichlorfon
72-0476
Trifluralin
72-0356
UC-34096
72-0357
Zectran
72-0180
Zineb
72-0305
Electrometry
Sarin
72-0618
Conductometry
72-0222
Organochlorines
72-0626
Coulometry
BHC
72-0404
Diazinon
72-0404
Dieldrin
72-0404
DDT
72-0404
Heptachlor
72-0404
Malathion
72-0404
Parathion
72-0404
Organochlorines
72-0626
Polarography
Dipterex
72-0502
DDVP
72-0502
Gravimetry
Dieldrin
72-0261

DDT
72-0261
DDT derived compounds
72-0261
DDT isomers
72-0261
TDE
72-0261
Kinetics
Carbaryl
72-0503
Parathion
72-0503
Manometry
Methyl parathion
72-0081
Parathion
72-0138
Radioassay
Aldrin
72-0175
Allethrin
72-0149
Atrazine
72-0468
Carbaryl
72-0342
Carbaryl derived compounds
72-0154
Chlormequat chloride
72-0185
D-D
72-0583
DDT
72-0175 72-0191
72-0578 72-0591
DDT derived compounds
72-0175 72-0578
DDT isomers
72-0152
Dieldrin
72-0175
Dieldrin derived compounds
72-0154
Endrin
72-0579
Methocarb
72-0180
Nemacur
72-0643
Parathion derived compounds
72-0154
Piperonyl butoxide
72-0154
Pyrethrins
72-0149
TDE
72-0578
Terbacil
72-0468
TFM
72-0605
TFM derived compounds
72-0605
Zectran
72-0180
Spectrometry
Baytex
72-0639
Chlorobenzilate
72-0470
Chloropropylate
72-0470
Diazinon
72-0639
Malathion
72-0639
Parathion
72-0639
Atomic absorption/ Emission
DDT derived compounds
72-0206
Polychlorinated biphenyls
72-0397
Colorimetry
Aldrin
72-0408
Aziridine
72-0223
Benomyl
72-0394
BHC
72-0404 72-0408
Captan
72-0408
Carbamates
72-0650
Chlordane
72-0408
Chloropicrin
72-0226
DDT
72-0260 72-0339
72-0404 72-0408
DDT derived compounds
72-0260
Diazinon
72-0404
Dicrotophos
72-0207
Dieldrin
72-0260 72-0404
72-0644
Endrin
72-0408 72-0644
Fenitrothion
72-0075
Heptachlor
72-0404
Heptachlor epoxide
72-0260
Lindane
72-0408
Malathion
72-0404
Monocrotophos
72-0207
Organophosphates
72-0637 72-0650
Paraquat
72-0217
Parathion
72-0138 72-0404
Phenylcarbamates
72-0391
Piperonyl butoxide
72-0164
Resmethrin
72-0420
TDE
72-0260
Tridemorph
72-0479
Diffraction
DDT
72-0150 72-0636
DDT derived compounds
72-0150
DDT isomers
72-0150
Flame Photometry
Aldicarb
72-0289
Diethion
72-0289
Dimethoate
72-0289
DMSO
72-0646
Lindane
72-0289
Malathion
72-0289
Maneb
72-0289
Methyl demeton
72-0289

Organophosphates
72-0646
Parathion
72-0289
Temik
72-0289
Thiran
72-0289
Fluorometry
Benomyl
72-0394
Fluenethyl
72-0642
1-Naphthaleneacetic acid
72-0462
Polychlorinated biphenyls
72-0366
Thiabendazole
72-0216
Infrared
72-0627 72-0628
BHC
72-0649
p-Chlorophenyl N-methylcarbamate
72-0581
Diquat
72-0640
Endosulfan
72-0538
Lindane
72-0649
MPMC
72-0214
MTMC
72-0214
Nemacur
72-0643
Paraquat
72-0640
Parathion
72-0651
PCB
72-0270
PCNB
72-0270
PCP
72-0270
2,4,5-T
72-0582
Trifluralin
72-0356
Mass Spectrometry
72-0622 72-0628
BAS 3191
72-0460
Chevron
72-0559
p-Chlorophenyl N-methylcarbamate
72-0581
2,4-D
72-0630
DCP
72-0310
DDE
72-0268
DDT
72-0268 72-0474
72-0630
DDT derived compounds
72-0474
Dieldrin
72-0474
Heptachlor
72-0474
Heptachlor epoxide
72-0474
Nemacur
72-0643
Organochlorines
72-0659
Parathion
72-0651
Polychlorinated biphenyls
72-0219 72-0630
72-0635
2,4,5-T
72-0630
TDE
72-0268
Neutron activation
Atrazine
72-0069
Mercurials
72-0329 72-0540
MSMA
72-0069
Paraquat
72-0069
NMR
72-0628
BAS 3191
72-0460
Polychlorinated biphenyls
72-0219
PMR
Aldrin derived compounds
72-0225
DDT
72-0161
Endrin derived compounds
72-0225
UV
72-0628
Aldrin
72-0218
Carbaryl
72-0503
Dieldrin
72-0218
DDT
72-0218
DDT derived compounds
72-0218
Heptachlor
72-0218
Heptachlor epoxide
72-0218
Hexachlorobenzene
72-0218
Lindane
72-0218
Parathion
72-0503 72-0651
PCNB
72-0270
PCP
72-0270
Polycarbazine
72-0305
Polychlorinated biphenyls
72-0218 72-0270
72-0397
TDE
72-0218
Thiabendazole
72-0216
Topsin
72-0212
Zineb
72-0305
Titration
Aminocarb
72-0601
Banol
72-0601
Bux
72-0601
Carbaryl
72-0601
Chlorobenzilate
72-0470
Chloropropylate
72-0470
Dimetan
72-0601
Dimetilan
72-0601
Formetanate
72-0601

GS-15171
72-0601
Isolane
72-0601
Mesurol
72-0601
Mobam
72-0601
Phenmediphan
72-0601
Promecarb
72-0601
Propoxur
72-0601
Pyrolan
72-0601
Zectran
72-0601
Ultrasonic
Dieldrin
72-0638
DDE
72-0638
DDT
72-0638
Heptachlor epoxide
72-0638
Lindane
72-0638
Vacuum sublimation
Endosulfan
72-0538
Associations/Organizations
72-0035
DDT
72-0247 72-0423
Herbicides
72-0020
Beneficial Effects
72-0426
BHC
72-0439
2,4-D
72-0001 72-0016
DDT
72-0004 72-0013
72-0015 72-0439
72-0443
Dexon
72-0032
Gardona
72-0527
Herbicides
72-0002
2,4,5-T
72-0001
Biochemical effects
General
Human
Organophosphates
72-0085
Microorganisms
Herbicides
72-0071
Amino acids/Peptides/
Proteins
Animals/Experimental
Organophosphates
72-0146
Human
Bordeaux mixture
72-0568
Copper sulfate
72-0568
Paraquat
72-0103
In vitro
Folpet
72-0120
Folpet derived
compounds
72-0120
Wildlife
Polychlorinated
biphenyls
72-0366
BUN
Human
Paraquat
72-0103
Carbohydrates
Animals/Experimental
DDT
72-0169
DDT derived
compounds
72-0169
DDT isomers
72-0169
Fluoroacetamide
72-0341 72-0589
MNFA
72-0587
TDE
72-0169
Human
Paraquat
72-0103
In vitro
Paraquat
72-0572
Creatinine
Human
Paraquat
72-0103
Lipids/Steroids/Sterols
DDT
72-0161 72-0436
Organochlorines
72-0436
Polychlorinated
biphenyls
72-0436
Animals/Domestic
DDT
72-0459
Animals/Experimental
DDT
72-0169
DDT derived
compounds
72-0169
DDT isomers
72-0169
Organochlorines
72-0571
TDE
72-0169
Human
TDE
72-0131
In vitro
Carbaryl derived
compounds
72-0154
Dieldrin derived
compounds
72-0154
Parathion derived
compounds
72-0154
Piperonyl butoxide
72-0154
Wildlife
Endrin
72-0105
Minerals
Animals/Experimental
DDT derived
compounds
72-0206
Microorganisms
Dinoseb
72-0172
Linuron
72-0172
Wildlife
DDT
72-0031
DDT derived
compounds
72-0206
Nitrogen fixation
Microorganisms
Carbaryl
72-0205
Dieldrin
72-0574

DDT
72-0205
Lindane
72-0574
Nucleic Acids
Animals/Experimental
Dalapon-Na
72-0127
Porphyrins
Piperonyl butoxide
72-0164
Animals/Domestic
Dinobuton
72-0598
Dinobuton derived compounds
72-0598
Animals/Experimental
Organochlorines
72-0571
Polychlorinated biphenyls
72-0571
Polychlorobenzofuran
72-0571
Sodium chlorate
72-0134
Plant
72-0445
Respiration
In vitro
Carboxin
72-0125
Carboxin derived compounds
72-0125
Plant
Carboxin
72-0125
Carboxin derived compounds
72-0125
TCA cycle
Human
Organofluorines
72-0086
Vitamins/Coenzymes
Piperonyl butoxide
72-0164
Animals/Experimental
Dichlorvos
72-0348
DDT
72-0350 72-0595
DDT derived compounds
72-0338 72-0350 72-0595
DDT isomers
72-0338 72-0595
Lead
72-0350
In vitro
Famphur
72-0580
Malathion
72-0580
Organophosphates
72-0580
Parathion
72-0580
Blood/Body fluids
General
Animals/Experimental
Chlordane
72-0542
Dicumarol
72-0168
Methocarb
72-0180
MNFA
72-0587
Zectran
72-0180
Human
BHC
72-0557
Dieldrin
72-0557
DDT
72-0557
DDT derived compounds
72-0557
Methyl parathion
72-0548
Methylene chloride
72-0104
Paraquat
72-0103
Parathion
72-0548
In vitro
Methocarb
72-0180
Paraoxon
72-0181
Parathion
72-0181
Zectran
72-0180
Cells
Parathion
72-0138
Animals/Domestic
Dinobuton
72-0598
Dinobuton derived compounds
72-0598
Animals/Experimental
Carbamates
72-0343
DFP
72-0593
Paraquat
72-0619
Human
Chlordane
72-0554
DDT
72-0554
Lindane
72-0554
Parathion
72-0554
In vitro
Carbamates
72-0121
HS 6
72-0119
HS 8
72-0119
Obidoxime
72-0119
PM2OP
72-0119
PM3P
72-0119
TMB4
72-0119
Edema
Human
Malathion
72-0097
Methemoglobinemia
Animals/Domestic
Sodium chlorate
72-0535
Plasma/Serum
DFP
72-0592
Parathion
72-0138
Animals/Experimental
Bordeaux mixture
72-0568
Copper sulfate
72-0568
Dieldrin
72-0600
Dieldrin derived compounds
72-0600
DFP
72-0593
Fluoroacetamide
72-0589
MNFA
72-0586

Sodium chlorate
72-0134
Human
72-0549
DDT
72-0533
DDT derived compounds
72-0449 72-0533
Paraquat
72-0537
Pralidoxime
72-0196
In vitro
Aminocarb
72-0601
Banol
72-0601
Bux
72-0601
Carbaryl
72-0601
Dimetan
72-0601
Dimetilan
72-0601
Formetanate
72-0601
GS-15171
72-0601
Isolane
72-0601
Mesurol
72-0601
Moban
72-0601
Phenmedipham
72-0601
Promecarb
72-0601
Propoxur
72-0601
Pyrolan
72-0601
Zectran
72-0601
Wildlife
Parathion
72-0200
Rumen
Animals/Domestic
Dinobuton
72-0598
Dinobuton derived compounds
72-0598
Animals/Experimental
Dinobuton
72-0598
Dinobuton derived compounds
72-0598
DDT
72-0578
DDT derived compounds
72-0578
TDE
72-0578
Carcinogenesis
General
72-0335 72-0445
Chlordane
72-0288
DDT
72-0252 72-0567
Heptachlor
72-0288
Lindane
72-0288
Malathion
72-0288
2,4-D
72-0238
2,4,5-T
72-0252
Animals/Experimental
Chlordane
72-0171
2,4-D
72-0118
trans-4,4'-Dichlorostilbene
72-0132
DDT
72-0132
DDT derived compounds
72-0132
DDT isomers
72-0132
Endrin
72-0166
TDE
72-0132
Zineb
72-0193
Cardiovascular System
General
Animals/Experimental
Fluoroacetamide
72-0588
Human
B-BHC
72-0365
Dieldrin
72-0365
DDT
72-0365
DDT derived compounds
72-0365
DDT isomers
72-0365
Blood pressure
Human
MNFA
72-0505
Organophosphates
72-0085
Paraquat
72-0537
Blood vessels
Animals/Experimental
Endrin
72-0166
Heart
Animals/Domestic
Arochlor
72-0353
DDT
72-0459
TMPD
72-0353
Animals/Experimental
DFP
72-0593
Fluoroacetamide
72-0588 72-0589
MNFA
72-0586 72-0587
O-Ethyl-S-(2-dimethylaminoethyl) methylthiophosphonat
72-0590
Soman
72-0590
Human
Malathion
72-0097
MNFA
72-0505
Paraquat
72-0537
In vitro
Fluoroacetamide
72-0589
Conferences
Organophosphates
72-0440
Paraquat
72-0526
Cytological effects
General
Animals/Experimental

Bromopropylate
72-0174
Chlorobenzilate
72-0174
Chloropropylate
72-0174
Dalapon-Na
72-0127
Methyl mercaptophos
72-0203
In vitro
Bromopropylate
72-0174
Chlorobenzilate
72-0174
Chloropropylate
72-0174
Chromosomes/genes
Human
72-0445
Wildlife
Polychlorinated Biphenyls
72-0331
Endoplasmic reticulum
Animals/Experimental
Dalapon-Na
72-0127
Growth
Human
72-0445
Microsomes
Animals/Experimental
Carbon tetrachloride
72-0584
DDT
72-0339 72-0363 72-0584
DDT derived compounds
72-0338
DDT isomers
72-0338
Methyl eugenol
72-0111
Methylenedioxyanilin
72-0111
Organochlorines
72-0571
Piperonyl butoxide
72-0111
Safrole
72-0111
Vanillylamine
72-0111
In vitro
Carbaryl derived compounds
72-0154
Dicofol
72-0603
Dieldrin derived compounds
72-0154
DDT
72-0186 72-0603
DDT derived compounds
72-0338
DDT isomers
72-0338
Endosulfan
72-0603
Parathion derived compounds
72-0154
Phosphamidon
72-0359
Piperonyl butoxide
72-0154
Wildlife
Dicofol
72-0603
DDT
72-0186 72-0603
Endosulfan
72-0603
Polychlorinated biphenyls
72-0444
Mitochondria
Carbaryl
72-0202
DDT
72-0202
Animals/Experimental
Carboxin
72-0125 72-0379
Carboxin derived compounds
72-0125
Endrin
72-0579
Fluoroacetamide
72-0589
In vitro
Aldrin
72-0614
BHC
72-0614
Carboxin
72-0125
Carboxin derived compounds
72-0125
Chlordane
72-0614
Dieldrin
72-0614
Endrin
72-0614
Fluoroacetamide
72-0589
Heptachlor
72-0614
Heptachlor epoxide
72-0614
Lindane
72-0614
Toxaphene
72-0614
Microorganisms
DFP
72-0609
Plant
Carboxin
72-0125
Carboxin derived compounds
72-0125
Wildlife
Aldrin
72-0376
Chlordane
72-0376
Dicofol
72-0376
DDT
72-0376
DDT isomers
72-0376
Endrin
72-0376
Heptachlor
72-0376
Heptachlor epoxide
72-0376
Polychlorinated biphenyls
72-0366
TDE
72-0376
Digestive System
General
Human
Methyl Bromide
72-0237
TDE
72-0131
Wildlife
DDT
72-0370
Parathion
72-0370
Toxaphene
72-0370

Alimentary tract
  Animals/Domestic
    Lead Arsenate
      72-0322
    MSMA
      72-0602
    Thallium
      72-0553
    2,4-D
      72-0602
    2,4,5-T
      72-0602
  Animals/Experimental
    Coumaphos
      72-0349
    Crufomate
      72-0349
    D-D
      72-0583
    Fluoroacetamide
      72-0588
    Thiabendazole
      72-0155
    Trichlorfon
      72-0349
  Human
    Paraquat
      72-0103 72-0319
      72-0321
  In vitro
    DDT
      72-0153 72-0578
    DDT derived
    compounds
      72-0578
    TDE
      72-0578
  Wildlife
    DDT
      72-0153
Liver
    Dieldrin
      72-0278
    DDT
      72-0278 72-0432
    Heptachlor epoxide
      72-0278
    Parathion
      72-0651
    Polychlorinated
    biphenyls
      72-0432
  Animals/Domestic
    Aldicarb
      72-0463
    Aldicarb derived
    compounds
      72-0463
    DDT
      72-0459
    DFP
      72-0609
    Ipronidazole
      72-0381
    Thallium
      72-0553
  Animals/Experimental
    Azinphos methyl
      72-0215
    Bromopropylate
      72-0174
    Carbon tetrachloride
      72-0584
    Carboxin
      72-0125 72-0379
    Carboxin derived
    compounds
      72-0125
    Chlorfenvinphos
      72-0113
    Chlormequat chloride
      72-0185
    Chlorobenzilate
      72-0174
    Chloropropylate
      72-0174
    Demeton methyl
      72-0215
    Dichlorvos
      72-0348
    Dieldrin
      72-0600
    Dieldrin derived
    compounds
      72-0600
    Dielorin
      72-0358
    Dimethoate
      72-0215
    DDE
      72-0448
    DDT
      72-0169 72-0191
      72-0339 72-0448
      72-0584 72-0621
    DDT derived
    compounds
      72-0169
    DDT isomers
      72-0169
    DFP
      72-0592
    Endrin
      72-0166 72-0579
    Famphur
      72-0580
    Fenitrothion
      72-0373
    Fluoroacetamide
      72-0588
    Heptachlor
      72-0373 72-0448
      72-0565
    Malathion
      72-0215 72-0580
    Methocarb
      72-0180
    Mevinphos
      72-0215
    MNFA
      72-0587
    Organochlorines
      72-0571
    Organophosphates
      72-0580
    Paraoxon
      72-0181
    Parathion
      72-0181 72-0215
      72-0580
    Polychlorinated
    biphenyls
      72-0018 72-0571
    Polychlorobenzofuran
      72-0571
    PNMC
      72-0373
    Thiabendazole
      72-0155
    TDE
      72-0169
    Zectran
      72-0180
  Human
    Organochlorines
      72-0472
    Polychlorinated
    biphenyls
      72-0472
    DDT
      72-0506 72-0621
    Organophosphates
      72-0514 72-0518
    Paraquat
      72-0319 72-0321
      72-0537 72-0544
    Parathion
      72-0514
    Trichlorfon
      72-0543
    TMTD
      72-0519
  In vitro
    Bromopropylate
      72-0174
    Carbaryl
      72-0342
    Carbaryl derived
    compounds
      72-0154

Carboxin
72-0125
Carboxin derived compounds
72-0125
Chlormequat chloride
72-0185
Chlorobenzilate
72-0174
Chloropropylate
72-0174
Dieldrin derived compounds
72-0154
Dielorin
72-0358
DDT
72-0186
Famphur
72-0580
Malathion
72-0580
Methocarb
72-0180
Organophosphates
72-0147 72-0514
72-0580
Paraoxon
72-0181
Parathion
72-0181 72-0514
72-0580
Parathion derived compounds
72-0154
Phosphamidon
72-0359
Piperonyl butoxide
72-0154
Zectran
72-0180

Wildlife
Dieldrin
72-0044 72-0482
DDT
72-0044 72-0186
72-0308 72-0482
DDT derived compounds
72-0308 72-0482
DDT isomers
72-0044
Endrin
72-0105
Mercurials
72-0540
Mercury
72-0236
Panogen
72-0178
Polychlorinated biphenyls
72-0366 72-0444
72-0482
TDE
72-0308

Pancreas
Animals/Experimental
Dalapon-Na
72-0127
DDT
72-0191
Human
DDT
72-0621

Stomach
Animals/Domestic
Strychnine
72-0645

Education/Training
72-0239 72-0248
72-0250
Herbicides
72-0232

Endocrine system
Adrenal
Animals/Domestic
Aldrin
72-0197
Animals/Experimental
DDT
72-0595
DDT derived compounds
72-0595
DDT isomers
72-0595
Fluoroacetamide
72-0588
TDE
72-0169
Human
TDE
72-0131
In vitro
DDT
72-0595
DDT derived compounds
72-0595
DDT isomers
72-0595

Pancreas (Islets)
Animals/Experimental
DFP
72-0593
Endrin
72-0166

Pituitary
Animals/Experimental
Carbaryl
72-0179

Spleen
Animals/Experimental
Thiabendazole
72-0155

Thyroid
Animals/Domestic
Aldrin
72-0197
Animals/Experimental
Mancozeb
72-0558
Maneb
72-0558
Zineb
72-0558

Environmental Pollution
72-0017 72-0235
72-0248 72-0430
72-0539
Aldrin
72-0240
Arsenicals
72-0424
BHC
72-0240 72-0439
Dieldrin
72-0240
DDT
72-0004 72-0014
72-0240 72-0241
72-0246 72-0252
72-0432 72-0433
72-0436 72-0439
72-0443
Herbicides
72-0424
Insecticides
72-0233
Mercurials
72-0025 72-0098
Organochlorines
72-0436
Organophosphates
72-0501
Polychlorinated biphenyls
72-0432 72-0433
72-0436 72-0444

PCP
72-0240
2,4,5-T
72-0252 72-0424
Enzyme activity
BTDU
72-0362
Dieldrin
72-0362
DDT
72-0362
General
Chevron
72-0559
Chlordane
72-0542
DDT
72-0339 72-0432
72-0576
DDT derived compounds
72-0576
Methoxychlor
72-0576
Polychlorinated biphenyls
72-0432 72-0444
TDE
72-0576
Aconitase
Organofluorines
72-0086
Acylamidase
Linuron
72-0454
Adenosine triphosphatase
Dicofol
72-0562 72-0603
DDT
72-0153 72-0562
72-0603
Endosulfan
72-0562 72-0603
Aliesterase
Baytex
72-0376
Coumaphos
72-0376
Dasanit
72-0376
Delnav
72-0376
Demeton
72-0376
Dimethoate
72-0376
Disulfoton
72-0376
Ethion
72-0376
EPN
72-0376
Folex
72-0376
Guthion
72-0376
Methyl demeton
72-0376
Methyl parathion
72-0376
OMPA
72-0376
Parathion
72-0376
Phosdrin
72-0376
Ronnel
72-0376
Trithion
72-0376
Alkaline phosphatase
Dichlorvos
72-0564
Heptachlor
72-0565
Alpha-Chymotrypsin
Folpet
72-0120
Folpet derived compounds
72-0120
Aminopyrine demethylase
Methyl eugenol
72-0111
Methylenedioxyanilin
72-0111
Piperonyl butoxide
72-0111
Safrole
72-0111
Vanillylamine
72-0111
Beta-Glucuronidase
Dichlorvos
72-0564
Carbonic anhydrase
DDT
72-0031
Carboxyl esterases
Bromopropylate
72-0174
Chlorobenzilate
72-0174
Chloropropylate
72-0174
DDT
72-0350
DDT derived compounds
72-0350
Lead
72-0350
Cholinesterase
72-0156 72-0167
72-0336 72-0445
p-Chlorophenyl N-methylcarbamate
72-0581
Aldicarb
72-0369
Aldrin
72-0376
Aminocarb
72-0601
Azinphosmethyl
72-0369
Banol
72-0108 72-0601
Bux
72-0601
Carbamates
72-0121 72-0136
72-0139 72-0343
Carbaryl
72-0369 72-0585
72-0601
Carbofuran
72-0369
Chlordane
72-0376
Chlorfenvinphos
72-0165
Chlormequat chloride
72-0185
Coumaphos
72-0349
Crotoxyphos
72-0165
Crufomate
72-0349
DDT
72-0133 72-0376
DDT isomers
72-0376
DFP
72-0133 72-0145
72-0377 72-0585
72-0592
Diazinon
72-0471
Diazinon analogs and metabolites
72-0471
Dichlorvos
72-0165 72-0551
72-0564

Dicofol
72-0376
Dicrotophos
72-0165 72-0369
Dimetan
72-0601
Dimethoate derived compounds
72-0122
Dimetilan
72-0601
Dursban
72-0369
EDEMS
72-0361
Endrin
72-0376
Eserine
72-0585
O-Ethyl-S-(2-diethylaminoethyl) methylthiophosphonat
72-0585
O-Ethyl-S-(2-dimethylaminoethyl) methylthiophosphonat
72-0585 72-0590
Fenitrothion
72-0373
Fenthion
72-0368
Formetanate
72-0601
GS-15171
72-0601
Heptachlor
72-0373 72-0376
Heptachlor epoxide
72-0376
Isolane
72-0601
Malathion
72-0096 72-0143
72-0369 72-0585
Mesurol
72-0601
Methomyl
72-0369
Methyl parathion
72-0369
Mevinphos
72-0165
Moban
72-0601
Monocrotophos
72-0165 72-0369
Organochlorines
72-0089
Organophosphates
72-0084 72-0136
72-0137 72-0139
72-0143 72-0146
72-0194 72-0325
72-0440 72-0552
Paraoxon
72-0165 72-0173
72-0181
Parathion
72-0086 72-0108
72-0181 72-0200
72-0520
Phenmedipham
72-0601
Promecarb
72-0601
Propoxur
72-0601
Pyrolan
72-0601
PHFP
72-0361
PNMC
72-0373
Quaternary ammonium compounds
72-0133
Soman
72-0145 72-0375
72-0585 72-0590
SD-14045
72-0165
Trichlorfon
72-0349 72-0547
TDE
72-0376
TEPP
72-0585
WL-22864
72-0165
Zectran
72-0601
1-Naphthyldimethylcarb
72-0585
Dehydrogenase
Methyl parathion
72-0081
Esterase
Malathion
72-0106
Esterases
Aldrin
72-0083
Famphur
72-0580
Malathion
72-0580
Organophosphates
72-0580
Parathion
72-0580
2,4-D
72-0083
2,4,5-T
72-0083
Glucose-6-phosphate dehydrogenase
DDT
72-0595
DDT derived compounds
72-0595
DDT isomers
72-0595
Glutamic oxaloacetic transaminase
Dichlorvos
72-0564
Heptachlor
72-0565
Glutamic pyruvic transaminase
Dichlorvos
72-0564
Heptachlor
72-0565
Lactic dehydrogenase
72-0549
Heptachlor
72-0565
MNFA
72-0586 72-0587
Mixed function oxidases
DDT derived compounds
72-0338
DDT isomers
72-0338
Organochlorines
72-0571
Monoamine oxidase
Banol
72-0108
Parathion
72-0108
NADH-Oxidase
Arochlor
72-0353
TMPD
72-0353
Phosphofructokinase
Fluoroacetamide
72-0589
Succinoxidase
Arochlor
72-0353

Carboxin
72-0125
Carboxin derived compounds
72-0125
TMPD
72-0353
Transaminases
MNFA
72-0586
UDP glucuronyltransferase
Carbaryl derived compounds
72-0154
Dieldrin derived compounds
72-0154
Parathion derived compounds
72-0154
Piperonyl butoxide
72-0154

Excretory System

General
Animals/Experimental
D-D
72-0583
Human
Paraquat
72-0103 72-0537
Kidney
PMA
72-0569
Animals/Domestic
Aldicarb
72-0463
Aldicarb derived compounds
72-0463
DDT
72-0281 72-0459
DFP
72-0609
Ipronidazole
72-0381
Thallium
72-0553
Animals/Experimental
Bordeaux mixture
72-0508
Chlorfenvinphos
72-0113
Copper sulfate
72-0568
Dieldrin
72-0600
Dieldrin derived compounds
72-0600
Fluoroacetamide
72-0588
Methocarb
72-0180
Phencapton
72-0128
PMA
72-0570
Sodium chlorate
72-0134
Zectran
72-0180
Human
Dieldrin
72-0532
Organophosphates
72-0518
Paraquat
72-0319 72-0321
72-0526 72-0544
TMTD
72-0519
In vitro
Dicofol
72-0562
DDT
72-0562
Endosulfan
72-0562
Methocarb
72-0180
Zectran
72-0180
Wildlife
Aldrin
72-0376
Chlordane
72-0376
Dicofol
72-0376 72-0562
72-0603
DDT
72-0370 72-0376
72-0562 72-0603
DDT isomers
72-0376
Endosulfan
72-0562 72-0603
Endrin
72-0376
Heptachlor
72-0376
Heptachlor epoxide
72-0376
Parathion
72-0370
Toxaphene
72-0370
TDE
72-0376

Experimental Design

72-0054 72-0434
72-0539
BHC
72-0439
Carbamates
72-0142 72-0343
DDT
72-0150 72-0439
DDT derived compounds
72-0150
DDT isomers
72-0150
Fungicides
72-0234
Nematocides
72-0234
Organophosphates
72-0142 72-0194
2,4,5-T
72-0431

Factors Influencing Metabolism/Toxicity

General
DDT
72-0636
Adaptation
72-0019
DDT
72-0135
Endrin
72-0105
Organophosphates
72-0194
Age
Chlordane
72-0542
Dieldrin
72-0044
DDT
72-0044
DDT isomers
72-0044
Zineb
72-0545
Alcohol intoxication
Trichlorfon
72-0543
Anethesia
Chlorfenvinphos
72-0165
Crotoxyphos
72-0165

Dichlorvos
72-0165
Dicrotophos
72-0165
Mevinphos
72-0165
Monocrotophos
72-0165
Paraoxon
72-0165
SD-14045
72-0165
WL-22864
72-0165
Biological magnification
72-0023
DDT
72-0320 72-0436
Mercurials
72-0536 72-0541
Organochlorines
72-0436
Polychlorinated biphenyls
72-0436 72-0444
Sodium floroacetate
72-0025
Thallium
72-0025
Zinc phosphide
72-0025
Disease state
DDT
72-0186
Humidity
Diphenamid
72-0458
Zineb
72-0545
Interactions
72-0156
trans-4,4'-Dichlorostilbene
72-0132
Atrazine
72-0069
BHC
72-0340
Carbamates
72-0142
Chlordane
72-0171
Chlormequat chloride
72-0185
Dicumarol
72-0168
Dieldrin
72-0457
Dioxin
72-0345
DDT
72-0132 72-0340
72-0350 72-0457
DDT derived compounds
72-0132 72-0350
72-0457 72-0613
72-0615
DDT isomers
72-0132 72-0613
Fluometuron
72-0051
Herbicides
72-0033
Lead
72-0350
Methyl eugenol
72-0111
Methylenedioxyanilin
72-0111
MSMA
72-0069
Organophosphates
72-0142
Paraoxon
72-0181
Paraquat
72-0069
Parathion
72-0181
Pentachlorophenol
72-0028
Piperonyl butoxide
72-0111
Prometryne
72-0051
Safrole
72-0111
TDE
72-0132
Vanillylamine
72-0111
Zectran
72-0059
2,4-D
72-0345
2,4,5-T
72-0345
Light/radiation
72-0057
Diphenamid
72-0458
1-Naphthaleneacetic acid
72-0462
Nutritional state
Aldrin
72-0197
Banol
72-0108
BHC
72-0441
Dieldrin
72-0457
DDT
72-0170 72-0441
72-0457 72-0578
72-0591
DDT derived compounds
72-0170 72-0457
72-0578
Endrin
72-0166 72-0441
Lindane
72-0441
Parathion
72-0108
TDE
72-0578
Pregnancy
Dieldrin
72-0044 72-0532
DDT
72-0044
DDT isomers
72-0044
Route
Chlormequat chloride
72-0185
Fenthion
72-0047
Paraoxon
72-0181
Parathion
72-0181
Phencapton
72-0128
Trichlorfon
72-0047
Schedule of dosage
Aldrin
72-0083
Fenthion
72-0047
MSMA
72-0602
Trichlorfon
72-0047
2,4-D
72-0083 72-0602
2,4,5-T
72-0083 72-0602

Season
Organophosphates
72-0084
Trichlorfon
72-0547
Sex
Dieldrin
72-0044 72-0600
Dieldrin derived compounds
72-0600
DDT
72-0044
DDT isomers
72-0044
Zineb
72-0545
Solubility
Chlorfenvinphos
72-0165
Crotoxyphos
72-0165
Dichlorvos
72-0165
Dicrotophos
72-0165
Mevinphos
72-0165
Monocrotophos
72-0165
Organophosphates
72-0508
Paraoxon
72-0165
SD-14045
72-0165
WL-22864
72-0165
Species
Abate
72-0117
Aldicarb
72-0140
Aldicarb derived compounds
72-0140
Azinphosmethyl
72-0606
Bux
72-0140
Bux derived compounds
72-0140
Carbamates
72-0121 72-0139
Carbaryl
72-0140
Carbaryl derived compounds
72-0140
Carbofuran
72-0140
Carbofuran derived compounds
72-0140
Carbon tetrachloride
72-0584
Chlorfenvinphos
72-0113
Chlorothalonil
72-0159
Daninifos
72-0159
Demeton
72-0117
Dicrotophos
72-0117
Dieldrin
72-0117
Dodine
72-0159
Dursban
72-0117
DDT
72-0133 72-0584
DFP
72-0133
EPN
72-0117
Fenthion
72-0117
Kitazin-P
72-0159
Landrin
72-0117
Meobal
72-0140
Meobal derived compounds
72-0140
Methocarb
72-0180
Methomyl
72-0140
Methomyl derived compounds
72-0140
Moban
72-0117
Monocrotophos
72-0117
Organophosphates
72-0137 72-0139
72-0194
Oxydemeton methyl
72-0117
Parathion
72-0117 72-0606
Propoxur
72-0117 72-0140
Propoxur derived compounds
72-0140
PCP
72-0159
Quaternary ammonium compounds
72-0133
Sodium fluoroacetate
72-0117
Strychnine
72-0117
Thiram
72-0159
Zectran
72-0117 72-0180
Temperature
Chlordane
72-0542
Dyfonate
72-0078
DDT
72-0346 72-0604
Pentachlorophenol
72-0028
Thionazin
72-0078
Trichlorfon
72-0547
1-Naphthaleneacetic acid
72-0462
Immunology
Animals/Experimental
DDT derived compounds
72-0613
DDT isomers
72-0613
Humans
DDT
72-0546
MCPA
72-0082
Zineb
72-0545
Integument
Feathers
Wildlife
Aldrin
72-0199
Dieldrin
72-0199
Glands
Animals/Domestic
DDT
72-0459

Hair/Fur
Animals/Domestic
Thallium
72-0553
Animals/Experimental
Zineb
72-0193
Skin
Animals/Domestic
Thallium
72-0553
Human
72-0549
Carboxide
72-0158
Difolatan
72-0515
Dyrene
72-0516
Metham
72-0550
MCPA
72-0082
Polychlorinated biphenyls
72-0018
THTD
72-0519
Zineb
72-0545
Wildlife
Carbaryl
72-0187
Endrin
72-0187

Laws and Regulations
General
72-0019 72-0022
72-0250
Herbicides
72-0232
German Federal Republic
BHC
72-0439
DDT
72-0438 72-0439
Lindane
72-0438
International
Arsenicals
72-0424
Herbicides
72-0424
2,4,5-T
72-0424
Italy
Aldrin
72-0072
Chlordane
72-0072
DDT
72-0072
Japan
Aldrin
72-0437
BHC
72-0031 72-0437
72-0439 72-0441
Dieldrin
72-0437
DDT
72-0432 72-0437
72-0439 72-0441
Endrin
72-0437 72-0441
Lindane
72-0441
Polychlorinated biphenyls
72-0432
Mexico
Endrin
72-0442
Organochlorines
72-0442
New Zealand
72-0243 72-0244
Poland
72-0328
Sweden
Mercurials
72-0541
USA
72-0239
General
72-0021
Dioxin
72-0345
Herbicides
72-0425
2,4-D
72-0345
2,4,5-T
72-0345
EPA
72-0254
DDT
72-0247 72-0432
Polychlorinated biphenyls
72-0432
Florida
72-0549
FDA
Aldrin
72-0060
BHC
72-0439
Dieldrin
72-0060 72-0278
DDT
72-0060 72-0432
72-0433 72-0439
Heptachlor
72-0060
Heptachlor epoxide
72-0060 72-0278
Lindane
72-0060
Polychlorinated biphenyls
72-0018 72-0432
72-0433
New York
72-0549
State
72-0021
Texas
72-0428
TVA
2,4-D
72-0238
USDA
Herbicides
72-0068
USSR
Demeton
72-0237
DDT
72-0237
Lindane
72-0237
Malathion
72-0237
Methyl parathion
72-0237
Schradan
72-0237
Sodium arsenite
72-0237
Zinc phosphide
72-0237
World Health Organization
DDT
72-0423

Metabolism
General
72-0019
Carbamates
72-0142
Organophosphates
72-0142

Biotransformation
Aldicarb
72-0140
Aldicarb derived compounds
72-0140
Bux
72-0140
Bux derived compounds
72-0140
Carbamates
72-0452
Carbaryl
72-0140
Carbaryl derived compounds
72-0140
Carbofuran
72-0140
Carbofuran derived compounds
72-0140
DDT
72-0150
DDT derived compounds
72-0150
DDT isomers
72-0150
Meobal
72-0140
Meobal derived compounds
72-0140
Methomyl
72-0140
Methomyl derived compounds
72-0140
Organophosphates
72-0147
Propoxur
72-0140
Propoxur derived compounds
72-0140
Distribution/Storage
DDT
72-0436
Organochlorines
72-0436
Polychlorinated biphenyls
72-0436
Birds
Biotransformation
Aldrin
72-0198
Dieldrin
72-0198
DDT
72-0198
DDT derived compounds
72-0198
Lindane
72-0198
Polychlorinated biphenyls
72-0198
TDE
72-0198
Chicken
General
Aldicarb
72-0463
Aldicarb derived compounds
72-0463
Biotransformation
Aldicarb
72-0463
Aldicarb derived compounds
72-0463
DDT
72-0170
DDT derived compounds
72-0170
DDT isomers
72-0152
Distribution/Storage
DDT
72-0170
DDT derived compounds
72-0170
Excretion
Aldicarb
72-0463
Aldicarb derived compounds
72-0463
Cow
Biotransformation
DDT
72-0041
DDT derived compounds
72-0041 72-0596
DDT isomers
72-0596
Fenthion
72-0047
Trichlorfon
72-0047
Distribution/Storage
BHC
72-0031
DDT
72-0041
DDT derived compounds
72-0041
Fenthion
72-0047
Heptachlor
72-0176
Heptachlor epoxide
72-0176
Lead Arsenate
72-0322
Trichlorfon
72-0047
Excretion
BHC
72-0031 72-0441
Dieldrin
72-0192
DDT
72-0192 72-0441
DDT derived compounds
72-0192 72-0596
DDT isomers
72-0596
Endrin
72-0441
Gardona
72-0360
Lindane
72-0441
Tridemorph
72-0479
TDE
72-0192
Crustacea
Biotransformation
Aldrin
72-0175
Dieldrin
72-0175
DDT
72-0175
DDT derived compounds
72-0175
Dog
Biotransformation
Methocarb
72-0180
Zectran
72-0180
Excretion
Chlorobenzilate
72-0470

Chloropropylate
72-0470
Sodium chlorate
72-0134
Earthworm
Biotransformation
DDT isomers
72-0177
TDE
72-0177
Fish
Distribution/Storage
Azinphosmethyl
72-0606
Endrin
72-0579
Parathion
72-0606
Goat
Biotransformation
p-Chlorophenyl N-methylcarbamate
72-0581
Distribution/Storage
p-Chlorophenyl N-methylcarbamate
72-0581
Excretion
p-Chlorophenyl N-methylcarbamate
72-0581
Goldfish
Biotransformation
DDT
72-0190
Distribution/Storage
DDT
72-0190
Hen
General
DDE
72-0374
DDT
72-0374
Human
Absorption
Carboxide
72-0158
Organophosphates
72-0508
Biotransformation
Banol
72-0357
Carbaryl
72-0357
Methyl parathion
72-0548
Parathion
72-0548
UC-34096
72-0357
Distribution/Storage
BHC
72-0441
Dieldrin
72-0532
DDT
72-0441
Endrin
72-0441
Lindane
72-0441
Paraquat
72-0319
Excretion
Lindane
72-0086
Paraquat
72-0103 72-0217
Pralidoxime
72-0196
In Vitro
Absorption
Carbaryl
72-0129
Carbaryl derived compounds
72-0129
Biotransformation
Bromopropylate
72-0174
Carbaryl
72-0129
Carbaryl derived compounds
72-0129 72-0154
Chlorobenzilate
72-0174
Chloropropylate
72-0174
Dieldrin derived compounds
72-0154
Dinobuton
72-0598
Dinobuton derived compounds
72-0598
DDT
72-0578
DDT derived compounds
72-0578
Famphur
72-0580
Malathion
72-0580
Methocarb
72-0180
Organophosphates
72-0580
Parathion
72-0580
Parathion derived compounds
72-0154
Piperonyl butoxide
72-0154
TDE
72-0578
Zectran
72-0180
Microorganisms
General
72-0057
Atrazine
72-0563
Chlorobenzilate
72-0470
Chloropropylate
72-0470
Copper oxychloride
72-0563
Diquat
72-0563
DDT
72-0563 72-0576
DDT derived compounds
72-0576
DNOC
72-0563
Malathion
72-0563
Methoxychlor
72-0576
Methyl parathion
72-0081
Mevinphos
72-0076
MCPA
72-0563
Paraquat
72-0563
Phorate
72-0076
Thiometon
72-0563
Trichlorfon
72-0563
TDE
72-0576
Zectran
72-0059
Zineb
72-0563

Biotransformation
Carbaryl
72-0456
Dieldrin
72-0457
DDT
72-0457 72-0591
DDT derived compound
72-0457
Linuron
72-0454
Malathion
72-0106
Excretion
Dieldrin
72-0188
Mouse
Biotransformation
Butacarb
72-0560
Carbaryl
72-0342
Chlormequat chloride
72-0185
DDT
72-0151
DDT derived compounds
72-0151
Paraoxon
72-0181
Parathion
72-0181
Rotenone derived compounds
72-0123
Excretion
Carbaryl
72-0342
Pig
Biotransformation
Fenthion
72-0047
Trichlorfon
72-0047
Distribution/Storage
Fenthion
72-0047
Trichlorfon
72-0047
Plants
General
Amitrole
72-0354
Carbaryl
72-0354 72-0355
Carbofuran
72-0354
Chloramben
72-0354
Chlorfenvinphos
72-0354
Chlorpropham
72-0354 72-0355
Dicamba
72-0354 72-0355
Disulfoton
72-0354
Dyfonate
72-0354 72-0355
Fensulfothion
72-0354
Kerb
72-0354 72-0355
Linuron
72-0354 72-0355
Malathion
72-0354 72-0355
MCPB
72-0162
Propanil
72-0354 72-0355
Pyrazon
72-0354 72-0355
PCNC
72-0354
2,4-DB
72-0354
Absorption
Atrazine
72-0069
Dieldrin
72-0188
Diphenamid
72-0458
DDT derived compounds
72-0063
Lindane
72-0063
MSMA
72-0069
Paraquat
72-0069
Polychlorinated biphenyls
72-0063
Biotransformation
Aldicarb
72-0140
Aldicarb derived compounds
72-0140
Banol
72-0357
Bux
72-0140
Bux derived compounds
72-0140
Carbamates
72-0055 72-0452
Carbaryl
72-0140 72-0357
Carbaryl derived compounds
72-0140
Carbofuran
72-0140
Carbofuran derived compounds
72-0140
Diazinon
72-0471
Diazinon analogs and metabolites
72-0471
Diphenamid
72-0458
Maneb
72-0055
Meobal
72-0140
Meobal derived compounds
72-0140
Methomyl
72-0140
Methomyl derived compounds
72-0140
Nabam
72-0055
Nemacur
72-0643
Propoxur
72-0140
Propoxur derived compounds
72-0140
Soman
72-0046
UC-34096
72-0357
Zineb
72-0055
2,4-D
72-0042
2,4-D derived compounds
72-0042
Porpoise
Biotransformation
Dieldrin
72-0044
DDT
72-0044
DDT isomers
72-0044

Distribution/Storage
Dieldrin
72-0044
DDT
72-0044
DDT isomers
72-0044
Quail
Biotransformation
DDT isomers
72-0152
Excretion
DDT derived compounds
72-0615
Rabbit
Biotransformation
Methocarb
72-0180
Zectran
72-0180
Rat
Absorption
BHC
72-0340
Carbaryl
72-0129
Carbaryl derived compounds
72-0129
DDT
72-0340
Biotransformation
p-Chlorophenyl N-methylcarbamate
72-0581
Allethrin
72-0149
Bromopropylate
72-0174
Carbaryl
72-0129 72-0342
Carbaryl derived compounds
72-0129
Carbon tetrachloride
72-0584
Chlorobenzilate
72-0174
Chloropropylate
72-0174
Dichlorvos
72-0348
DDT
72-0584
DDT isomers
72-0152
Famphur
72-0580
Malathion
72-0580
Organophosphates
72-0580
Parathion
72-0520 72-0580
Pyrethrins
72-0149
TFM
72-0605
TFM derived compounds
72-0605
2,4,5-T
72-0582
Distribution/Storage
p-Chlorophenyl N-methylcarbamate
72-0581
Azinphos methyl
72-0215
Demeton methyl
72-0215
Dieldrin
72-0600
Dieldrin derived compounds
72-0600
Dielorin
72-0358
Dimethoate
72-0215
DDT
72-0350
DDT derived compounds
72-0350
Lead
72-0350
Malathion
72-0215
Mevinphos
72-0215
Parathion
72-0215
Excretion
p-Chlorophenyl N-methylcarbamate
72-0581
BHC
72-0340
BTDU
72-0362
Carbaryl
72-0342
D-D
72-0583
Dieldrin
72-0192
Dieldrin
72-0358 72-0362
DDT
72-0192 72-0340
72-0362
DDT derived compounds
72-0192
DDT isomers
72-0616
TDE
72-0192
TFM
72-0605
TFM derived compounds
72-0605
2,4,5-T
72-0582
Sheep
Biotransformation
Dinobuton
72-0598
Dinobuton derived compounds
72-0598
DDT
72-0578
DDT derived compounds
72-0578
DDT isomers
72-0152
Fenthion
72-0047
Trichlorfon
72-0047
TDE
72-0578
Distribution/Storage
Fenthion
72-0047
Trichlorfon
72-0047
Excretion
Sodium chlorate
72-0535
Snail
Distribution/Storage
DDT
72-0191
Excretion
DDT
72-0191

Morbidity and Mortality Statistics
Canada
Malathion
72-0097

Germany
Metham
72-0550
Japan
BHC
72-0441
DDT
72-0086 72-0441
Endrin
72-0086 72-0441
Lindane
72-0086 72-0441
Mercurials
72-0086 72-0098
Organofluorines
72-0086
Parathion
72-0086
Switzerland
72-0555
USA
72-0549
Arsenicals
72-0607
Disulfoton
72-0087
Lindane
72-0087
Malathion
72-0087
Mevinphos
72-0087
Parathion
72-0087
Strychnine
72-0087
Warfarin
72-0087
Musculoskeletal system
General
Animals/Experimental
DFP
72-0377
Wildlife
Aldrin
72-0376
Chlordane
72-0376
Dicofol
72-0376
DDT
72-0376
DDT isomers
72-0376
Endrin
72-0376
Heptachlor
72-0376
Heptachlor epoxide
72-0376
TDE
72-0376
Diaphragm
Animals/Experimental
EDEMS
72-0361
PMFP
72-0361
Muscle, smooth
Animals/Domestic
DDT
72-0459
Muscle, striated
Dieldrin
72-0278
DDT
72-0278
Heptachlor epoxide
72-0278
Animals/Domestic
Aldicarb
72-0463
Aldicarb derived
compounds
72-0463
DDT
72-0459
Animals/Experimental
Carbaryl
72-0116
Chlordane
72-0116
DDT
72-0116
Parathion
72-0116
Human
Malathion
72-0090
Organophosphates
72-0090
In vitro
Carbaryl
72-0116
Chlordane
72-0116
DDT
72-0116
Paraoxon
72-0173
Parathion
72-0116
Myocardium
Human
Malathion
72-0097
Paraquat
72-0319
Skeleton/bone
In vitro
Trimethylphosphate
72-0371
TEPA
72-0371
Skeleton/Bone
Animals/Experimental
Dioxin
72-0345
Sodium Fluoride
72-0204
2,4-D
72-0345
2,4,5-T
72-0345
Mutagenesis/Teratogenesis
General
72-0335
organochlorines
72-0472
polychlorinated
biphenyls
72-0472
DDT
72-0433
Herbicides
72-0573
Polychlorinated
biphenyls
72-0433
2,4,5-T
72-0431
Animals/Experimental
Dioxin
72-0345
2,4-D
72-0345
2,4,5-T
72-0345 72-0617
Humans
72-0445
Wildlife
Mercurials
72-0541
Polychlorinated
Biphenyls
72-0331
Nervous System
General
Animals/Experimental
Cartap derived
compounds
72-0124
Chlordane
72-0542

Herbicides
72-0157
MNFA
72-0587
Human
72-0549
Mercurials
72-0086
Methyl Bromide
72-0237
Organophosphates
72-0518
Parathion
72-0138
In vitro
Cartap derived compounds
72-0124
Behavior
Animals/Experimental
Banol
72-0108
DDT isomers
72-0612
Parathion
72-0108
Wildlife
Carbaryl
72-0187
Endrin
72-0187
Polychlorinated biphenyls
72-0189
Blood-brain barrier
Animals/Experimental
Chlormequat chloride
72-0185
DFP
72-0145 72-0377
Endrin
72-0166 72-0579
Paraoxon
72-0181
Parathion
72-0181
Soman
72-0145
Brain
Animals/Domestic
DDT
72-0459
MSMA
72-0602
2,4-D
72-0602
2,4,5-T
72-0602
Animals/Experimental
Banol
72-0108
Bromophos
72-0372
Chlorfenvinphos
72-0113 72-0165
Crotoxyphos
72-0165
Dichlorvos
72-0165
Dicrotophos
72-0165
Dieldrin
72-0600
Dieldrin derived compounds
72-0600
DDT
72-0169
DDT derived compounds
72-0169
DDT isomers
72-0169
DFP
72-0592 72-0593
Endrin
72-0579
EDEMS
72-0361
Mevinphos
72-0165
Monocrotophos
72-0165
O-Ethyl-S-(2-dimethylaminoethyl) methylthiophosphonat
72-0590
Paraoxon
72-0165
Parathion
72-0108
PMFP
72-0361
Sarin
72-0618
Soman
72-0590
SD-14045
72-0165
TDE
72-0169
WL-22864
72-0165
Human
Carbaryl
72-0585
DFP
72-0585
Eserine
72-0585
Malathion
72-0585
Methylene chloride
72-0104
O-Ethyl-S-(2-diethylaminoethyl) methylthiophosphonat
72-0585
O-Ethyl-S-(2-dimethylaminoethyl) methylthiophosphonat
72-0585
Organophosphates
72-0552
Parathion
72-0528
Soman
72-0585
TEPP
72-0585
TMTD
72-0519
1-Naphthyldimethylcarb
72-0585
In vitro
Azinphos methyl
72-0230
Chlormequat chloride
72-0185
Diazinon
72-0230
Dicofol
72-0603
DDT
72-0603
Endosulfan
72-0603
Paraoxon
72-0181
Parathion
72-0181 72-0230
Phorate
72-0230
Wildlife
Aldicarb
72-0369
Aldrin
72-0199 72-0376
Azinphosmethyl
72-0230 72-0369
Carbaryl
72-0369

Carboturan
72-0369
Chlordane
72-0376
Diazinon
72-0230
Dicofol
72-0376 72-0603
Dicrotophos
72-0369
Dieldrin
72-0199
Dursban
72-0369
DDT
72-0308 72-0376
72-0603
DDT derived
compounds
72-0308
DDT isomers
72-0376
Endosulfan
72-0603
Endrin
72-0105 72-0376
Heptachlor
72-0376
Heptachlor epoxide
72-0376
Malathion
72-0369
Mercurials
72-0540 72-0541
Methomyl
72-0369
Methyl parathion
72-0369
Monocrotophos
72-0369
Parathion
72-0200 72-0230
Phorate
72-0230
TDE
72-0308 72-0376

EEG
Animals/Experimental
Bromophos
72-0372
DEDTC
72-0364
DS
72-0364
Human
72-0336
MNFA
72-0505
Parathion
72-0528

Paralysis
Human
DDT
72-0522
Organophosphates
72-0522
PCP
72-0522
2,4-D
72-0522

Parasympathetic Nerves
Parathion
72-0520
Human
Methyl parathion
72-0548
Parathion
72-0548

Peripheral Nerves
Animals/Experimental
DDT
72-0604
Thallium
72-0597
Human
DDT
72-0522
Organophosphates
72-0522
PCP
72-0522
2,4-D
72-0522

Polyneuritis
Animals/Experimental
Thallium
72-0597
Human
Trichlorfon
72-0543

Seizures
Animals/Domestic
Arsenicals
72-0332
Mercurials
72-0332
Organochlorines
72-0332
Human
Arsenicals
72-0332
Mercurials
72-0332
Organochlorines
72-0332

Spinal cord
Wildlife
Panogen
72-0178

Sympathetic nerves
Human
Organophosphates
72-0084

Sympathetic Nerves
Parathion
72-0520

New Journals
72-0231

Nomenclature
72-0328 72-0445

Photodecomposition
72-0057
Diazinon
72-0471
Diazinon analogs
and metabolites
72-0471
Dipterex
72-0502
DDT
72-0432
DDVP
72-0502
Picloram
72-0285
Polychlorinated
biphenyls
72-0432
1-Naphthaleneacetic
acid
72-0462
2,4,5-T
72-0285

Prevention
General
72-0019 72-0021
72-0022 72-0309
72-0426 72-0427
Azinphosethyl
72-0469
Blasticidan-S
72-0517
Carbaryl
72-0469
Diazinon
72-0469
Dieldrin
72-0509
Dimethoate
72-0469
DDT
72-0481 72-0509
72-0517
Heptachlor
72-0509
Herbicides
72-0033

Insecticides
72-0003
Maldison
72-0469
Mercurials
72-0536
Methidathion
72-0469
Methyl Parathion
72-0509
MSMA
72-0602
Organochlorines
72-0513
Organophosphates
72-0325 72-0440
72-0508 72-0513
72-0514 72-0518
Parathion
72-0514
Paration
72-0509
Phosdrine
72-0509
Trichlorfon
72-0543 72-0547
Trichlorphon
72-0469
2,4-D
72-0016 72-0602
2,4,5-T
72-0602
Decontamination
72-0057 72-0524
MCPA
72-0082
Organochlorines
72-0027
Organophosphates
72-0101
Detection
Parathion
72-0337
Disposal
72-0024 72-0427
72-0523 72-0524
72-0525
Atrazine
72-0333
Bromacil
72-0333
Carbaryl
72-0333
Dalapon
72-0333
Dibromochloropropane
72-0333
Dicamba
72-0333
Dieldrin
72-0333
Diuron
72-0333
DDT
72-0333 72-0534
DNBP
72-0333
DSMA
72-0333
Malathion
72-0333
Organophosphates
72-0101
Paraquat
72-0333
Pesticides
72-0295
Phenylmercuric acetate
72-0333
Picloram
72-0333
Polychlorinated biphenyls
72-0521
Trifluralin
72-0333
Vernolate
72-0333
Zineb
72-0333
2,4-D
72-0333
2,4,5-T
72-0333
Manufacturing Techniques
Chlorodibenzo-p-dioxin
72-0092
Picloram
72-0092
Silvex
72-0092
2,4-D
72-0092
2,4,5-T
72-0092
Non-persistant pesticides
Azinphosethyl
72-0469
Carbaryl
72-0469
Diazinon
72-0469
Dimethoate
72-0469
Maldison
72-0469
Methidathion
72-0469
Trichlorphon
72-0469
Poison Control Centers
Switzerland
72-0552 72-0555
USA
72-0085
Protective equipment
72-0328
Aldrin
72-0244
Dieldrin
72-0244
DDT
72-0244
Endosulfan
72-0244
Endrin
72-0244
Heptachlor
72-0244
Lindane
72-0244
MCPA
72-0082
Organophosphates
72-0101
TDE
72-0244
Zineb
72-0545
Purity of preparation
Carboxide
72-0158
Safe packaging
Aldrin
72-0244
Dieldrin
72-0244
DDT
72-0244
Endosulfan
72-0244
Endrin
72-0244 72-0442
Heptachlor
72-0244
Lindane
72-0244
Organochlorines
72-0442
Paraquat
72-0321
Sodium chlorate
72-0535

TDE
72-0244
Storage and transportation
72-0024 72-0328
72-0524 72-0525
Aldrin
72-0244
Dieldrin
72-0244
DDT
72-0244
Endosulfan
72-0244 72-0320
Endrin
72-0244 72-0442
Heptachlor
72-0244
Lindane
72-0244
Organochlorines
72-0442
TDE
72-0244

Reproduction/Growth
General
Animals/Experimental
DDT isomers
72-0616
2,4-D
72-0118
Microorganisms
Carbaryl
72-0205
Dieldrin
72-0574
DDT
72-0205 72-0591
Lindane
72-0574
Wildlife
Aldrin
72-0064 72-0198
Dieldrin
72-0064 72-0198
72-0312
DDT
72-0198 72-0308
72-0312
DDT derived compounds
72-0198 72-0308
Lindane
72-0198
Polychlorinated biphenyls
72-0189 72-0198
72-0444
TDE
72-0198 72-0308
Eggshell effects
Animals/Experimental
DDT derived compounds
72-0206
Wildlife
organochlorines
72-0472
polychlorinated biphenyls
72-0472
Dieldrin
72-0100 72-0324
DDE
72-0351
DDT
72-0031 72-0100
72-0320 72-0436
DDT derived compounds
72-0206 72-0329
Mercurials
72-0329
Organochlorines
72-0436
Polychlorinated biphenyls
72-0436
Polychlorinated Biphenyls
72-0329

Embryo/Fetus
Animals/Experimental
Dieldrin
72-0344
DDT
72-0163
Parathion
72-0344
Zineb
72-0193
Human
Dieldrin
72-0532
DDT
72-0533
DDT derived compounds
72-0533

Estrogens
Animals/Experimental
organochlorines
72-0472
polychlorinated biphenyls
72-0472

Fertility
Animals/Experimental
Carbaryl
72-0179
DDT isomers
72-0616
Zineb
72-0193
Human
72-0445
Wildlife
DDT
72-0599
DDT derived compounds
72-0599

Gametogenesis
72-0434

Growth
Animals/Experimental
Carbaryl
72-0179
DDT
72-0114 72-0163
DDT derived compounds
72-0114
2,4-D
72-0118
Human
72-0445
Microorganisms
72-0608
Aldrin
72-0347
Aldrin derived compounds
72-0347
Dieldrin
72-0107 72-0347
Dieldrin derived compounds
72-0347
Dinoseb
72-0172
Endrin
72-0347
Lindane
72-0107
Linuron
72-0172
Paraquat
72-0201
Simazine
72-0201
WL-19805
72-0201

Wildlife
Polychlorinated biphenyls
72-0189
Hormones
Polychlorinated biphenyls
72-0320
Animals/Domestic
Aldrin
72-0197
Animals/Experimental
Dicumarol
72-0168
DDT isomers
72-0612
Human
72-0445
TDE
72-0131
In vitro
Carbaryl derived compounds
72-0154
Dieldrin derived compounds
72-0154
Parathion derived compounds
72-0154
Piperonyl butoxide
72-0154
Neonate
Human
BHC
72-0557
Dieldrin
72-0557
DDT
72-0557
DDT derived compounds
72-0557
Wildlife
DDT
72-0599
DDT derived compounds
72-0599
Placental transfer
Animals/Experimental
Zineb
72-0193
Human
BHC
72-0557
Dieldrin
72-0532 72-0557
DDT
72-0533 72-0557
DDT derived compounds
72-0533 72-0557
Mercurials
72-0086
Reproductive organs, female
Animals/Experimental
Carbaryl
72-0179
DDT
72-0163
DDT isomers
72-0616
Endrin
72-0166
2,4,5-T
72-0130
Human
DDT
72-0533
DDT derived compounds
72-0533
Reproductive organs, male
Animals/Experimental
Carbaryl
72-0179
DDT
72-0363
Endrin
72-0166
Sterility
Animals/Experimental
2,4,5-T
72-0130
Wildlife
DDT
72-0599
DDT derived compounds
72-0599
Residue Degradation
Diazinon
72-0471
Diazinon analogs and metabolites
72-0471
Herbicides
72-0068
General
72-0309
Aldicarb
72-0140
Aldicarb derived compounds
72-0140
Bux
72-0140
Bux derived compounds
72-0140
Carbaryl
72-0140
Carbaryl derived compounds
72-0140
Carbofuran
72-0140
Carbofuran derived compounds
72-0140
Dieldrin
72-0656
DDT
72-0151 72-0578
DDT derived compounds
72-0151 72-0578
72-0656
Famphur
72-0580
Malathion
72-0580
Meobal
72-0140
Meobal derived compounds
72-0140
Methomyl
72-0140
Methomyl derived compounds
72-0140
Organophosphates
72-0580
Parathion
72-0580
Polychlorinated biphenyls
72-0521
Propoxur
72-0140
Propoxur derived compounds
72-0140
TDE
72-0578
Animals/Domestic
p-Chlorophenyl N-methylcarbamate
72-0581

Dieldrin
72-0192
DDT
72-0192 72-0578
DDT derived compounds
72-0192 72-0578
TDE
72-0192 72-0578
Food and Feed
Carbamates
72-0055
Diphenamid
72-0458
DDD
72-0300
DDT
72-0300 72-0578
DDT derived compounds
72-0578
Maneb
72-0055
Methyl parathion
72-0315
Nabam
72-0055
Nogos
72-0315
Phosalone
72-0464
TDE
72-0578
Zineb
72-0055
1-Naphthaleneacetic acid
72-0462
Humans
Chlorodibenzo-p-dioxin
72-0092
Methyl parathion
72-0548
Parathion
72-0548
Picloram
72-0092
Silvex
72-0092
2,4-D
72-0092
2,4,5-T
72-0092
Soil
Aldicarb
72-0140
Aldicarb derived compounds
72-0140
Aldrin
72-0065 72-0072
72-0073 72-0249
72-0293
Atrazine
72-0049 72-0249
72-0294
Benomyl
72-0073
Bromacil
72-0294
Bux
72-0140
Bux derived compounds
72-0140
BHC
72-0441
Captan
72-0073
Carbaryl
72-0073 72-0140
72-0249 72-0294
Carbaryl derived compounds
72-0140
Carbofuran
72-0140
Carbofuran derived compounds
72-0140
Chlordane
72-0072 72-0249
Chlorpropham
72-0049
Dalapon
72-0294
Diazinon
72-0249
Dicamba
72-0294
Dieldrin
72-0065 72-0073
72-0249 72-0277
72-0294 72-0457
72-0485
Diuron
72-0049 72-0249
72-0294
Dyfonate
72-0078
DBCP
72-0292 72-0294
DDT
72-0072 72-0073
72-0246 72-0249
72-0293 72-0294
72-0441 72-0457
72-0591
DDT derived compounds
72-0249
DNBP
72-0294
DSMA
72-0294
Endosulfan
72-0073
Endrin
72-0441 72-0485
Ethyl N-(3-chloro-4-methoxyphenyl) carbamate
72-0045
EDB
72-0292
Fluometron
72-0049
Heptachlor
72-0249 72-0485
Lindane
72-0073 72-0249
72-0293 72-0441
72-0485
Linuron
72-0454
Malathion
72-0106 72-0249
72-0294
Meobal
72-0140
Meobal derived compounds
72-0140
Methomyl
72-0140
Methomyl derived compounds
72-0140
Methoxychlor
72-0249
Metoxuron
72-0045
Mevinphos
72-0076
Monuron
72-0249
Nemacid
72-0249
Organophosphates
72-0073
Paraquat
72-0294
Parathion
72-0249
Pentachlorophenol
72-0028

Phenmedipham
72-0026
Phenmedipham
derived compounds
72-0026
Phorate
72-0073 72-0076
Picloram
72-0294
Propoxur
72-0140
Propoxur derived
compounds
72-0140
PMA
72-0294
Simazine
72-0049
Thionazin
72-0078
Toxaphen
72-0249
Trifluralin
72-0294
TDE
72-0249 72-0485
Vernolate
72-0294
Zineb
72-0294
1,3-D
72-0292
2,4-D
72-0049 72-0249
72-0294
2,4,5-T
72-0249 72-0294
3-Chloro-4-
methoxyacetanilide
72-0045
3-Chloro-4-
methoxyaniline
72-0045

Water
Aldicarb
72-0140
Aldicarb derived
compounds
72-0140
Bux
72-0140
Bux derived
compounds
72-0140
Carbaryl
72-0140 72-0456
Carbaryl derived
compounds
72-0140
Carbofuran
72-0140
Carbofuran derived
compounds
72-0140
Endosulfan
72-0480
Endosulfan derived
compounds
72-0480
Meobal
72-0140
Meobal derived
compounds
72-0140
Methomyl
72-0140
Methomyl derived
compounds
72-0140
Propoxur
72-0140
Propoxur derived
compounds
72-0140

Residue Dynamics
72-0523 72-0525
Aldrin
72-0064 72-0074
Ametryne
72-0079
Arsenicals
72-0323
Atrazine
72-0049 72-0053
Bromacil
72-0067
Chlorpropham
72-0049
Chlorthiamid
72-0070
Dichlobenil
72-0070
Dieldrin
72-0064
Diuron
72-0049 72-0053
72-0079
Dyfonate
72-0077
DDT
72-0478
DDT derived
compounds
72-0478
Fenitrothion
72-0029
Fluometron
72-0049
Fluometuron
72-0079
Herbicides
72-0068
Lindane
72-0074
Norea
72-0079
Organochlorines
72-0027
Prometryne
72-0079
Simazine
72-0049 72-0067
Terbacil
72-0079
Thionazin
72-0077
Triallate
72-0052
2,4-D
72-0016 72-0042
72-0049
2,4-D derived
compounds
72-0042

Residue Removal
General
72-0523 72-0524
72-0525
Dieldrin
72-0474
DDT
72-0474
DDT derived
compounds
72-0474
Heptachlor
72-0474
Heptachlor epoxide
72-0474
Food and Feed
Aldrin
72-0475
Chlordane
72-0475
Dieldrin
72-0475
Disulfoton
72-0272
DDT
72-0283 72-0475
DDT derived
compounds
72-0283 72-0475
Endrin
72-0475
Heptachlor epoxide
72-0475

Lindane
72-0475
Methoxychlor
72-0475
TDE
72-0283 72-0475
Humans
Paraquat
72-0103
Soil
72-0054
Dieldrin
72-0485
DDt
72-0485
Endrin
72-0485
Heptachlor
72-0485
Lindane
72-0485
TDE
72-0485
Water
DDT
72-0246
Endosulfan
72-0480
Endosulfan derived compounds
72-0480
Residue/Air
General
72-0019 72-0328
Acrylonitrile
72-0647
Carbon disulfide
72-0647
Carbon tetrachloride
72-0647
Chlordane
72-0288
Chloropicrin
72-0647
DDT
72-0246 72-0478
DDT derived compounds
72-0478
Ethylene dibromide
72-0647
Ethylene dichloride
72-0647
Ethylene oxide
72-0647
Heptachlor
72-0288
Lindane
72-0288
Malathion
72-0288
Methyl bromide
72-0647
Organophosphates
72-0518
Phosphine
72-0647
Rural
BHC
72-0213
Dieldrin
72-0213
DDT
72-0213
Urban
BHC
72-0213
Dieldrin
72-0213
DDT
72-0213
Residues/Domestic Animals
General
Chlordane
72-0299
Dichloruos
72-0382
Lindane
72-0299
PCP
72-0416
Ronnel
72-0411
Chickens
DDT
72-0433 72-0459
Polychlorinated biphenyls
72-0433
Cow
BHC
72-0031
DDT
72-0041 72-0281
DDT derived compounds
72-0041
Fenthion
72-0047
Trichlorfon
72-0047
Pig
Fenthion
72-0047
Trichlorfon
72-0047
Sheep
Fenthion
72-0047
Trichlorfon
72-0047
Turkeys
DDT
72-0433
Polychlorinated biphenyls
72-0433
Residues/Food and Feed
General
72-0019 72-0035
72-0407
Aldrin
72-0240
Azinphosethyl
72-0469
BHC
72-0240
Carbamates
72-0452
Carbaryl
72-0469
Diazinon
72-0469
Dieldrin
72-0240
Dimethoate
72-0469
DDE
72-0448
DDT
72-0240 72-0246
72-0252 72-0448
72-0653
DDT derived compounds
72-0653
Heptachlor
72-0448 72-0653
Maldison
72-0469
Methidathion
72-0469
Monitor
72-0393
Organophosphates
72-0501 72-0518
Polychlorinated biphenyls
72-0444
Polychloropinene
72-0653
PCP
72-0240
Trichlorphon
72-0469
2,4,5-T
72-0252

Alfalfa
Butylate
72-0388
Chlorpropham
72-0388
Cycloate
72-0388
Diallate
72-0388
Dichlormate
72-0388
DDT
72-0279
DDT derived compounds
72-0279
DDT isomers
72-0279
EPTC
72-0388
Molinate
72-0388
Pebulate
72-0388
Vernolate
72-0388
Almonds
72-0243
Animal feed
72-0477
Apples
72-0388
Aminozide
72-0209
Fluenethyl
72-0642
Formothion
72-0306
Methyl parathion
72-0315
Nogos
72-0315
Omite
72-0641
Polycarbazine
72-0305
Zineb
72-0305
Apricots
Omite
72-0641
Barley
Chloropicrin
72-0226
Tridemorph
72-0479
Beans
2,4-D
72-0275
Beef
BHC
72-0304
Beet Fat
DDT
72-0264
DDT derived compounds
72-0264
TDE
72-0264
Beets
Aldrin
72-0313
Chlordane
72-0313
Heptachlor
72-0313
Cabbage
Aldrin
72-0450
BHC
72-0450
Chlordane
72-0299
Dieldrin
72-0450
DDT
72-0450
Endrin
72-0450
EPN
72-0450
Lindane
72-0299
Malathion
72-0450
Parathion
72-0297 72-0450
Carrots
72-0450
Aldrin
72-0256
Chlordane
72-0299
Dieldrin
72-0256
DDT
72-0256
DDT derived compounds
72-0256
Heptachlor
72-0256
Heptachlor epoxide
72-0256
Lindane
72-0256 72-0299
TDE
72-0256
Celery
Aldrin
72-0450
BHC
72-0450
Dieldrin
72-0450
DDT
72-0450
Endrin
72-0450
EPN
72-0450
Malathion
72-0450
Parathion
72-0450
Cherries
Omite
72-0641
Chicken
DDT
72-0283
DDT derived compounds
72-0283
Polychlorinated biphenyls
72-0018
TDE
72-0283
Coffee
72-0243
Citrus
1-Naphthaleneacetic acid
72-0462
Citrus Pulp
Phosalone
72-0464
Torak
72-0271
Corn
Butylate
72-0388
Chlorpropham
72-0388
Cycloate
72-0388
Diallate
72-0388
Dichlormate
72-0388
Dieldrin
72-0644
Endrin
72-0644
EPTC
72-0388

Molinate
72-0388
Pebulate
72-0388
Phoxim
72-0274
Tridemorph
72-0479
TMTD
72-0519
Vernolate
72-0388
2,4-D
72-0275
Cottage Cheese
Polychlorinated
Biphenyls
72-0316
Cream
Polychlorinated
Biphenyls
72-0316
Crops
72-0410
Cucumber
Aldrin
72-0450
BHC
72-0450
Carbamates
72-0055
Carboturan
72-0386
Dieldrin
72-0450
DDT
72-0450
Endrin
72-0450
EPN
72-0450
Malathion
72-0450
Maneb
72-0055
Nabam
72-0055
Parathion
72-0450
Zineb
72-0055
Dairy Products
BHC
72-0304
DDT
72-0284
Egg plant
72-0450
Eggs
Aldicarb
72-0463
Aldicarb derived
compounds
72-0463
DDT
72-0433
Mercurials
72-0541
Polychlorinated
biphenyls
72-0018 72-0433
Fish
DDT
72-0432
Polychlorinated
biphenyls
72-0432
Fish-meal
Polychlorinated
biphenyls
72-0018
Flour
DDT
72-0283
DDT derived
compounds
72-0283
TDE
72-0283
Fodder
Endosulfan
72-0538
Fruit
72-0450
Chlorobenzilate
72-0470
Chloropropylate
72-0470
DDT
72-0283
DDT derived
compounds
72-0283
TDE
72-0283
Grapefruit
Omite
72-0641
Grapes
72-0450
Atrazine
72-0069
Dichlorzoline
72-0418
Fluenethyl
72-0642
MSMA
72-0069
Omite
72-0641
Paraquat
72-0069
Green-tea
72-0450
Japanese pear
72-0450
Kale
Dithane M-22
72-0389
Ethylene thiourea
72-0301
Maneb
72-0301 72-0389
Zineb
72-0389
Lemons
Torak
72-0271
Lettuce
Carbofuran
72-0386
Ethylene thiourea
72-0301
Maneb
72-0301
Milk
Aldrin
72-0060 72-0240
72-0475
Butonate
72-0476
BHC
72-0240 72-0441
Chlordane
72-0475
Chlorfenvinphos
72-0048
Crotoxyphos
72-0080
Dichlorvos
72-0476
Dieldrin
72-0060 72-0240
72-0475
DDT
72-0060 72-0240
72-0281 72-0441
72-0475
DDT derived
compounds
72-0475 72-0596
DDT isomers
72-0596
Endrin
72-0441 72-0475

Heptachlor
72-0060
Heptachlor epoxide
72-0060 72-0475
Lindane
72-0060 72-0441
72-0475
Methoxychlor
72-0475
Polychlorinated
Biphenyls
72-0316
PCP
72-0240
Trichlorfon
72-0476
Tridemorph
72-0479
TDE
72-0475
Must
Dichlorzoline
72-0418
Oat
DCDD
72-0273
DCP
72-0273
TCDD
72-0273
Onion
Disulfoton
72-0211
Fenthion
72-0211
Hinosan
72-0211
Oranges
Omite
72-0641
Phosalone
72-0464
Torak
72-0271
Peaches
72-0450
Fluenethyl
72-0642
Omite
72-0641
Pears
Fluenethyl
72-0642
Formothion
72-0306
Lovozal
72-0405
Plums
Fluenethyl
72-0642
Omite
72-0641
Pork
Mercurials
72-0536
Potatoes
72-0243
Aldrin
72-0450
Butylate
72-0388
BHC
72-0450
Carbofuran
72-0386
Chlordane
72-0299
Chlorpropham
72-0388
Cycloate
72-0388
D-D
72-0383
Diallate
72-0388
Dichlormate
72-0388
Dieldrin
72-0450
Disulfoton
72-0272
DDT
72-0450
Endrin
72-0450
EPN
72-0450
EPTC
72-0388
Lindane
72-0299
Malathion
72-0450
Molinate
72-0388
Omite
72-0641
Parathion
72-0450
Pebulate
72-0388
Vernolate
72-0388
Poultry
Organochlorines
72-0409
Polychlorinated
Biphenyls
72-0409
Radishes
72-0450
Rhubarb
72-0243
Rice
Aldrin
72-0240 72-0450
BHC
72-0240 72-0450
Chloropicrin
72-0226
Conen
72-0210
Dieldrin
72-0240 72-0450
Disulfoton
72-0211
DDT
72-0240 72-0283
72-0450
DDT derived
compounds
72-0283
Endrin
72-0450
EPN
72-0450
Fenthion
72-0211
Hinosan
72-0211
Malathion
72-0450
Parathion
72-0450
PCP
72-0240
TDE
72-0283
Safflower
72-0298
Seed grain
Mercurials
72-0536 72-0540
72-0541
Soy Bean
Butylate
72-0388
Chlorpropham
72-0388
Cycloate
72-0388
DCDD
72-0273
DCP
72-0273
Diallate
72-0388

Goat
p-Chlorophenyl N-methylcarbamate 72-0581
Guinea Pig
DDT 72-0363 72-0595
DDT derived compounds 72-0595
DDT isomers 72-0595
Fluoroacetamide 72-0589
Sarin 72-0618
Soman 72-0620
Thallium 72-0597
Hamster
Dioxin 72-0345
2,4-D 72-0345
2,4,5-T 72-0345
Invertebrates
Paraquat 72-0201
Simazine 72-0201
WL-19805 72-0201
Microorganisms 72-0608
Monkey
PMA 72-0569 72-0570
Mouse
trans-4,4'-Dichlorostilbene 72-0132
Butacarb 72-0560
Carbaryl 72-0342
Chevron 72-0559
Chlordane 72-0171 72-0542
Dimethoate derived compounds 72-0122
DDT 72-0132 72-0133 72-0339 72-0567
DDT derived compounds 72-0132 72-0338
DDT isomers 72-0132 72-0338
DFP 72-0133 72-0377
Menazon 72-0110
Methyl eugenol 72-0111
Methylenedioxyanilin 72-0111
Paraoxon 72-0181
Paraquat 72-0619
Parathion 72-0181
Piperonyl butoxide 72-0111
Polychlorinated biphenyls 72-0018
Quaternary ammonium compounds 72-0133
Rotenone derived compounds 72-0123
Safrole 72-0111
Sarin 72-0618
Soman 72-0620
Thiabendazole 72-0155
TDE 72-0132
Vanillylamine 72-0111
Zineb 72-0193
2,4-D 72-0238
Partridge 72-0117 72-0344
Pheasant 72-0117
Chlorfenvinphos 72-0113
Pigeon 72-0117
Chlorfenvinphos 72-0113
Quail 72-0117
Chlorfenvinphos 72-0113
Dursban 72-0575
Rabbit
DDE 72-0448
DDT 72-0163 72-0448
DEDTC 72-0364
DS 72-0364
Heptachlor 72-0448
Herbicides 72-0157
MMFA 72-0586 72-0587
Phosphamidon 72-0359
PMA 72-0569 72-0570
Soman 72-0620
2,4-D 72-0118
Rat
p-Chlorophenyl N-methylcarbamate 72-0581
Aldrin 72-0240
Arsenicals 72-0607
Azinphos methyl 72-0215
Banol 72-0108
Baytes 72-0376
Bordeaux mixture 72-0568
Bromophos 72-0372
BHC 72-0240 72-0340
BTDU 72-0362
Carbaryl 72-0116 72-0129 72-0179 72-0342
Carbaryl derived compounds 72-0129
Carbon tetrachloride 72-0584
Carboxin 72-0379
Chlordane 72-0116 72-0542

Nabam
72-0055
Tridemorph
72-0479
TMTD
72-0519
Zineb
72-0055
2,4,5-T
72-0282
Whey
Polychlorinated Biphenyls
72-0316
Wine
Dichlorzoline
72-0418

Residues/Humans
General
Aldrin
72-0451
BHC
72-0451 72-0557
Chlordane
72-0554
Dieldrin
72-0557
DDE
72-0448
DDT
72-0246 72-0283
72-0448 72-0451
72-0554 72-0557
DDT derived compounds
72-0283 72-0557
Heptachlor
72-0448
Lindane
72-0554
Mercurials
72-0098
Mercury
72-0451
Parathion
72-0554
TDE
72-0283
Adipose
Aldrin
72-0240
BHC
72-0031 72-0240
72-0441
Dieldrin
72-0240
DDT
72-0031 72-0086
72-0240 72-0432
72-0436 72-0441
Endrin
72-0441
Lindane
72-0441
Organochlorines
72-0436
Polychlorinated biphenyls
72-0432 72-0436
PCP
72-0240
Blood
Aldrin
72-0083
BHC
72-0557
Dieldrin
72-0557
2,4-D
72-0083
DDT
72-0557
DDT derived compounds
72-0326 72-0557
Methylene chloride
72-0104
Organophosphates
72-0085
Milk
DDT
72-0423 72-0436
Organochlorines
72-0436
Polychlorinated biphenyls
72-0280 72-0436
Organs
Methylene chloride
72-0104
Parathion
72-0651
Urine
Methyl parathion
72-0548
Organophosphates
72-0085
Paraquat
72-0103 72-0217
Parathion
72-0548
Pralidoxime
72-0196

Residues/Plants
General
Aldrin
72-0072 72-0410
Azinphosmethyl
72-0410
BHC
72-0304 72-0410
Carbamates
72-0650
Chlordane
72-0072 72-0299
72-0410
Cycloate
72-0317
Delachlor
72-0317
Diallate
72-0317
Diazinon
72-0410
Difolatan
72-0318
Dimethoate
72-0410
DCDD
72-0273
DCP
72-0273
DDT
72-0072 72-0410
72-0546
Endothall
72-0317
Heptachlor epoxide
72-0410
Lindane
72-0299 72-0410
Malathion
72-0410
Organochlorines
72-0027
Organophosphates
72-0650
Parathion
72-0337 72-0410
Pyrazon
72-0317
Toxaphene
72-0410
TCDD
72-0273
Alfalfa
Chlordane
72-0461
DDT
72-0264
DDT derived compounds
72-0264
Heptachlor
72-0461

Heptachlor epoxide
72-0461
TDE
72-0264
Algae
Aldrin
72-0064
Dieldrin
72-0064
DDT derived compounds
72-0063
Lindane
72-0063
Polychlorinated biphenyls
72-0063
Beans
72-0354 72-0355
Nemacur
72-0643
Beets
72-0354
Bitter orange
72-0289
Cabbage
Carbamates
72-0650
Organophosphates
72-0650
Chrysanthemum
Aminozide
72-0209
Corn stalks
Dieldrin
72-0644
Endrin
72-0644
Cotton
Thiabendazole
72-0216
Grass
Picloram
72-0066
Lavender
72-0289
Lettuce
72-0354
Medicinals
Dieldrin
72-0474
DDT
72-0474
DDT derived compounds
72-0474
Heptachlor
72-0474
Heptachlor epoxide
72-0474
Peanuts
Nemacur
72-0643
Phytoplankton
DDT
72-0467
Polychlorinated biphenyls
72-0467
Pink carnation
72-0289
Plantain
72-0354
Potatoes
Nemacur
72-0643
Rose
72-0289
Sugarbeet Leaves
Polycarbazine
72-0305
Zineb
72-0305
Tobacco
trans-4,4'-Dichlorostilbene
72-0132
DDT
72-0132
DDT derived compounds
72-0132
DDT isomers
72-0132
TDE
72-0132
Zineb
72-0545
Tomato leaf
72-0354 72-0355
Carbofuran
72-0386
Difolatan
72-0318
Nemacur
72-0643
Violet
72-0289
Weeds
2,4-D
72-0042
2,4-D derived compounds
72-0042
Wheat
72-0354
Soman
72-0046
Yellow-sarson
BHC
72-0276
Parathion
72-0276
Residues/Soil
General
72-0019 72-0054
72-0524 72-0525
gamma-chlordane
72-0262
gamma-Chlordane
72-0263
Aldrin
72-0065 72-0072
72-0240 72-0256
72-0262 72-0263
72-0410
Atrazine
72-0563
Azinphosmethyl
72-0410
BHC
72-0240 72-0304
72-0410
Carbofuran
72-0386
Chlordane
72-0072 72-0299
72-0410 72-0461
Chlorthiamid
72-0070
Copper oxychloride
72-0563
Dexon
72-0032
Diazinon
72-0311 72-0410
Dichlobenil
72-0070
Dicofol
72-0262 72-0263
Dieldrin
72-0065 72-0240
72-0256 72-0260
72-0262 72-0263
72-0457 72-0644
Dimethoate
72-0410
Diquat
72-0563
DDT
72-0072 72-0240
72-0256 72-0260
72-0262 72-0263
72-0410 72-0457
72-0563

DDT derived compounds
72-0256 72-0260
72-0262 72-0457
DNOC
72-0563
Endosulfan
72-0262 72-0263
Endrin
72-0262 72-0263
72-0644
Ethyl N-(3-chloro-4-methoxyphenyl) carbamate
72-0045
Ethylene thiourea
72-0301
Heptachlor
72-0256 72-0262
72-0263 72-0461
Heptachlor epoxide
72-0256 72-0260
72-0262 72-0263
72-0410 72-0461
Herbicides
72-0071
Lindane
72-0256 72-0262
72-0263 72-0299
72-0410
Lovozal
72-0405
Malathion
72-0410 72-0563
Maneb
72-0301
Methyl parathion
72-0081
Methyl Bromide
72-0291
Metoxuron
72-0045
MCPA
72-0563
Organophosphates
72-0501
Paraquat
72-0563
Parathion
72-0410
Picloram
72-0066
PCP
72-0240
Tetradifon
72-0263
Thiabendazole
72-0216
Thiometon
72-0563
Toxaphene
72-0263 72-0410
Trichlorfon
72-0563
Trifluralin
72-0228
TDE
72-0256 72-0260
72-0262
Zectran
72-0059
Zineb
72-0563
3-Chloro-4-methoxyacetanilide
72-0045
3-Chloro-4-methoxyaniline
72-0045
Adsorption
Aldrin
72-0074 72-0249
Atrazine
72-0053 72-0249
72-0468
Carbaryl
72-0249 72-0503
Chlordane
72-0249
Dalapon
72-0290
Diazinon
72-0249
Dichlorobenil
72-0290
Dieldrin
72-0249
Diquat
72-0640
Diuron
72-0053 72-0249
72-0290
DBCP
72-0292
DDT
72-0249 72-0483
DDT derived compounds
72-0249
Endosulfan
72-0483
EDB
72-0292
Fluometuron
72-0051
Heptachlor
72-0249
Herbicides
72-0068
Lindane
72-0074 72-0249
Malathion
72-0249
Mehtoxychlor
72-0483
Methoxychlor
72-0249
Monuron
72-0249
Nemacid
72-0249
Organochlorines
72-0027
Paraquat
72-0290 72-0640
Parathion
72-0249 72-0503
Prometryne
72-0051
Terbacil
72-0468 72-0634
Toxaphen
72-0249
TDE
72-0249
1,3-D
72-0292
2,4-D
72-0249
2,4,5-T
72-0249
Movement
72-0523
Aldrin
72-0073 72-0074
Ametryne
72-0079
Amiben
72-0398
Atrazine
72-0049 72-0398
72-0399
Azinphosmethyl
72-0398
Benomyl
72-0073
Bromacil
72-0067
BHC
72-0302
Captan
72-0073
Carbaryl
72-0073
Chlordane
72-0302

Chlorpropham
72-0049 72-0399
Dicamba
72-0398 72-0399
72-0400
Dieldrin
72-0073 72-0257
72-0261
Diphenamid
72-0398 72-0399
Diquat
72-0399
Diuron
72-0049 72-0079
72-0399
DDT
72-0073 72-0261
72-0296 72-0302
DDT derived compounds
72-0261 72-0302
DDT isomers
72-0261 72-0302
Endosulfan
72-0073
Fenac
72-0398 72-0399
72-0400
Fluometuron
72-0049 72-0051
72-0079
Herbicides
72-0068
Lindane
72-0073 72-0074
72-0257
Monuron
72-0398 72-0399
Norea
72-0079
Organophosphates
72-0073
Paraquat
72-0398 72-0399
Phorate
72-0073
Picloram
72-0285 72-0398
72-0399 72-0400
72-0447
Prometryne
72-0051 72-0079
Propham
72-0399
Simazine
72-0049 72-0067
72-0399
Terbacil
72-0079
Toxaphene
72-0296
Triallate
72-0052
TDE
72-0261
2,4-D
72-0049 72-0398
72-0399 72-0400
2,4,5-T
72-0285
Volatilization
Aldrin
72-0249 72-0303
Atrazine
72-0249
Carbaryl
72-0249
Chlordane
72-0249
Diazinon
72-0249
Dieldrin
72-0249 72-0257
72-0261 72-0303
Diuron
72-0249
Dyfonate
72-0077 72-0078
DCDD
72-0273
DCP
72-0273
DDT
72-0246 72-0249
72-0261 72-0303
DDT derived compounds
72-0249 72-0261
72-0303
DDT isomers
72-0261 72-0303
Fenitrothion
72-0029
Heptachlor
72-0249
Lindane
72-0249 72-0257
72-0303
Malathion
72-0249
Methoxychlor
72-0249
Monuron
72-0249
Nemacid
72-0249
Organochlorines
72-0027
Parathion
72-0249
Thionazin
72-0077 72-0078
Toxaphen
72-0249
Triallate
72-0303
TCDD
72-0273
TDE
72-0249 72-0261
2,4-D
72-0249
2,4,5-T
72-0249
Residues/Water
DDT
72-0432
Polychlorinated biphenyls
72-0432
General
72-0019 72-0523
72-0525
n-Dodecylguanidine acetate
72-0227
Aldrin
72-0243
Aminocarb
72-0243
Atrazine
72-0446 72-0563
Azinphos ethyl
72-0243
Azinphos methyl
72-0243
Bromophos
72-0243
Carbaryl
72-0243
Carbophenothion
72-0243
Chlorfenvinphos
72-0243
Copper oxychloride
72-0563
Dalapon
72-0290
Demeton
72-0243
Dichlorobenil
72-0290
Dichlorvos
72-0243
Dicrotophos
72-0243

Dieldrin
72-0243 72-0644
Dimethoate
72-0243
Diquat
72-0563
Disulfoton
72-0243
Diuron
72-0290
DDT
72-0014 72-0243
72-0246 72-0252
72-0287 72-0563
72-0577
DDT derived compounds
72-0063
DNOC
72-0563
Endosulfan
72-0160 72-0243
Endrin
72-0243 72-0644
Ethion
72-0243
Ethoate-methyl
72-0243
Ethoxychlor
72-0577
Fenitrothion
72-0243
Fensultothion
72-0243
Fenthion
72-0243
Formothion
72-0243
Heptachlor
72-0243
Herbicides
72-0068
Lead arsenate
72-0243
Lindane
72-0063 72-0243
72-0287
Malathion
72-0563
Maldison
72-0243
Menazon
72-0243
Mercurials
72-0025
Methiocarb
72-0243
Methomyl
72-0243
Methoxychlor
72-0577
Methyl parathion
72-0243
Mevinphos
72-0243
Monocrotophos
72-0243
MCPA
72-0563
Naled
72-0243
Organochlorines
72-0027 72-0466
Paraquat
72-0290 72-0563
Parathion
72-0243
Phenthoate
72-0243
Phorate
72-0243
Phosalone
72-0243
Phosmet
72-0243
Phosphamidon
72-0243
Picloram
72-0066 72-0446
Polychlorinated biphenyls
72-0063 72-0633
Pyrethrum
72-0243
PCP
72-0416
Rotenone
72-0243
Terbacil
72-0634
Thiometon
72-0243 72-0563
Thionazin
72-0243
Trichlorfon
72-0243 72-0563
Trichloronate
72-0243
TDE
72-0243
TEPP
72-0243
Zineb
72-0563
2,4-D
72-0238 72-0446
2,4,5-T
72-0252 72-0446
Aquifer
Atrazine
72-0286
Picloram
72-0286
Trifluralin
72-0286
Coastal
DDT
72-0455
DDT derived compounds
72-0455
TDE
72-0455
Drinking fountain
Arsenicals
72-0323
Estuaries
Aldrin
72-0062
Chlordane
72-0062
Dieldrin
72-0062
DDT
72-0062
DDT derived compounds
72-0062
Endrin
72-0062
Heptachlor
72-0062
Heptachlor epoxide
72-0062
Lindane
72-0062
Methoxychlor
72-0062
Toxaphene
72-0062
TDE
72-0062
Lakes
DDT
72-0465
DDT derived compounds
72-0465
Endosulfan
72-0465
Lindane
72-0465
Paraquat
72-0061
Polychlorinated biphenyls
72-0465

Oceans
72-0023
DDT
72-0467
Endosulfan
72-0034
Polychlorinated biphenyls
72-0467
Ponds
Carbaryl
72-0456
Kerosene
72-0330
Rivers
DDT
72-0465
DDT derived compounds
72-0465
Endosulfan
72-0320 72-0465
Lindane
72-0465
Organochlorines
72-0058
Organophosphates
72-0658
Polychlorinated biphenyls
72-0465
Streams
Dieldrin
72-0266 72-0267
DDT
72-0266
DDT derived compounds
72-0266
DDT isomers
72-0266
TDE
72-0266
Surface
72-0328

Residues/Wildlife
General
72-0019
Dieldrin
72-0260 72-0261
72-0267 72-0312
DDT
72-0260 72-0261
72-0265 72-0312
DDT derived compounds
72-0260 72-0261
72-0265
DDT isomers
72-0261
Heptachlor epoxide
72-0260
TDE
72-0260 72-0261
72-0265
Birds
Organochlorines
72-0472
Polychlorinated biphenyls
72-0472
Aldrin
72-0198 72-0199
Dieldrin
72-0198 72-0199
72-0482
DDT
72-0198 72-0246
72-0432 72-0482
DDT derived compounds
72-0198 72-0482
Lindane
72-0198
Mercurials
72-0540
Mercury
72-0236
Polychlorinated biphenyls
72-0198 72-0432
72-0444 72-0482
TDE
72-0198
Eggs
Aldrin
72-0198
Dieldrin
72-0198
DDT
72-0198
DDT derived compounds
72-0198 72-0329
72-0615
Lindane
72-0198
Mercurials
72-0329 72-0540
Mercury
72-0236
Polychlorinated biphenyls
72-0198 72-0329
72-0331
TDE
72-0198
Fish/Aquatic/Marine life
Organochlorines
72-0472
Polychlorinated biphenyls
72-0472
Aldrin
72-0062 72-0064
72-0175
Chlordane
72-0062
Dieldrin
72-0044 72-0062
72-0064 72-0175
72-0255 72-0259
72-0266 72-0267
DDT
72-0044 72-0062
72-0175 72-0246
72-0255 72-0258
72-0259 72-0266
72-0307 72-0432
72-0433 72-0455
72-0467 72-0577
DDT derived compounds
72-0062 72-0175
72-0258 72-0259
72-0266 72-0455
DDT isomers
72-0044 72-0266
Endrin
72-0062 72-0105
Ethoxychlor
72-0577
Heptachlor
72-0062
Heptachlor epoxide
72-0062
Lindane
72-0062
Mercurials
72-0098
Methoxychlor
72-0062 72-0577
Organochlorines
72-0409
Polychlorinated biphenyls
72-0409 72-0432
72-0433 72-0467
Toxaphene
72-0062
TDE
72-0062 72-0255
72-0258 72-0259
72-0266 72-0455
2,4-D
72-0094

Mammals
Dieldrin
72-0044
DDT
72-0044 72-0246
72-0308
DDT derived compounds
72-0308
DDT isomers
72-0044
Organochlorines
72-0409
Polychlorinated biphenyls
72-0409
TDE
72-0308
Reptiles/Amphibians
DDT
72-0246

Respiratory System
General
Animals/Experimental
D-D
72-0583
Fluoroacetamide
72-0588
Human
72-0336
DDT
72-0546
MNFA
72-0505
Organophosphates
72-0088
Paraquat
72-0321 72-0537
Gills
Animals/Experimental
DDT
72-0346
Endrin
72-0166
In vitro
Dieldrin
72-0195
DDT
72-0153
Malathion
72-0195
Methoxychlor
72-0195
Rotenone
72-0195
Wildlife
Dicofol
72-0603
Dieldrin
72-0195
DDT
72-0153 72-0603
Endosulfan
72-0603
Malathion
72-0195
Methoxychlor
72-0195
Rotenone
72-0195
Lung
Animals/Experimental
Chlordane
72-0171
O-Ethyl-S-(2-dimethylaminoethyl) methylthiophosphonat
72-0590
Paraquat
72-0619
Sarin
72-0618
Soman
72-0590
Zineb
72-0193
Human
Banol
72-0357
Carbaryl
72-0357
Methylene chloride
72-0104
Paraquat
72-0103 72-0504
72-0526 72-0544
UC-34096
72-0357
In vitro
Paraquat
72-0572
Paralysis
Human
Malathion
72-0090
Organophosphates
72-0090
Parathion
72-0086
Upper respiratory tract
Human
Organochlorines
72-0513
Organophosphates
72-0513
Paraquat
72-0537

Sensory System
Balance
Aldicarb
72-0369
Azinphosmethyl
72-0369
Carbaryl
72-0369
Carbofuran
72-0369
Dicrotophos
72-0369
Dursban
72-0369
Malathion
72-0369
Methomyl
72-0369
Methyl parathion
72-0369
Monocrotophos
72-0369
Animals/Experimental
DDT
72-0604
Human
Methyl Bromide
72-0237
Organophosphates
72-0085
Pralidoxime
72-0196
TDE
72-0131
Wildlife
Carbaryl
72-0187
Endrin
72-0187
Hearing
Human
Organophosphates
72-0085
Trichlorfon
72-0547
Taction
Human
Trichlorfon
72-0543 72-0547
Vision
Animals/Domestic
Thallium
72-0553
Human
72-0549
Blasticidan-S
72-0517
DDT
72-0517

Methyl Bromide
72-0237
Organochlorines
72-0513
Organophosphates
72-0084 72-0085
72-0513
Parathion
72-0528
Pralidoxine
72-0196
Trichlorfon
72-0547
Therapeutic use
Carcinoma
TDE
72-0131
Jaundice
DDT
72-0423 72-0621
Tumors
Chlordane
72-0171
Zoxazolamine paralysis
Chlordane
72-0542
DDT
72-0339
Toxicity/Domestic Animals
General
72-0555
Aldrin
72-0244
Coumatetralyl
72-0429
Dieldrin
72-0244
DDT
72-0244 72-0246
Endosulfan
72-0244
Endrin
72-0244
Heptachlor
72-0244
Lindane
72-0244
Methyl Bromide
72-0510
TDE
72-0244
Warfarin
72-0429
Chicken
DDT
72-0459
Cow
Aldrin
72-0197
Arochlor
72-0353
Bromophos
72-0453
Butonate
72-0453
Dichlorvos
72-0453
Dimethoate
72-0453
Endosulfan
72-0538
Fenthion
72-0368
Heptachlor
72-0176
Heptachlor epoxide
72-0176
Lead Arsenate
72-0322
MSMA
72-0602
Trichlorfon
72-0453
TMPD
72-0353
2,4-D
72-0602
2,4,5-T
72-0602
Dog
Chlorobenzilate
72-0470
Chloropropylate
72-0470
Strychnine
72-0645
Thallium
72-0553
Duck
DDE
72-0448
DDT
72-0448
Heptachlor
72-0448
Pig
Bromophos
72-0453
Butonate
72-0453
Dichlorvos
72-0453
Dimethoate
72-0453
Trichlorfon
72-0453
Sheep
Bromophos
72-0453
Butonate
72-0453
Dichlorvos
72-0453
Dimethoate
72-0453
Dinobuton
72-0598
Dinobuton derived
compounds
72-0598
Sodium chlorate
72-0535
Trichlorfon
72-0453
Turkey
Ipronidazole
72-0381
Toxicity/Experimental Animals
General
Aldrin
72-0437
Aminocarb
72-0601
Banol
72-0601
Bux
72-0601
BHC
72-0437
Carbamates
72-0139 72-0142
Carbanolate
72-0144
Carbaryl
72-0144 72-0601
Carbaryl derived
compounds
72-0144
Coumatetralyl
72-0429
Diazinon
72-0471
Diazinon analogs
and metabolites
72-0471
Dieldrin
72-0437
Dimetan
72-0601
Dimetilan
72-0601
DDT
72-0150 72-0437
DDT derived
compounds
72-0150

DDT isomers
72-0150
Endrin
72-0437
Formetanate
72-0601
GS-15171
72-0601
Insecticides
72-0003
Isolane
72-0601
Landrin
72-0144
Malathion
72-0143
Mesurol
72-0601
Methyl mercaptophos
72-0203
Moban
72-0144 72-0601
Organochlorines
72-0571
Organophosphates
72-0139 72-0142
72-0143 72-0146
72-0183 72-0194
Phenmedipham
72-0601
Polychlorinated biphenyls
72-0571
Polychlorobenzofuran
72-0571
Promecarb
72-0144 72-0601
Propoxur
72-0144 72-0601
Propoxur derived compounds
72-0144
Propylene oxide
72-0184
Pyrolan
72-0601
Sodium Fluoride
72-0204
Warfarin
72-0429
Zectran
72-0601

Cat
DEDTC
72-0364
DS
72-0364
Soman
72-0620

Chicken
Aldicarb
72-0463
Aldicarb derived compounds
72-0463
Carbon tetrachloride
72-0584
DDT
72-0169 72-0170
72-0584
DDT derived compounds
72-0169 72-0170
DDT isomers
72-0169
DFP
72-0592 72-0593
TDE
72-0169

Cow
Coumaphos
72-0349
Crufomate
72-0349
Dieldrin
72-0192
DDT
72-0192
DDT derived compounds
72-0192
Gardona
72-0360
Trichlorfon
72-0349
TDE
72-0192

Crayfish
Allethrin
72-0148
Pyrethrins
72-0148

Dog
Aldrin
72-0240
BHC
72-0240
Dichlorvos
72-0564
Dieldrin
72-0240 72-0600
Dieldrin derived compounds
72-0600
DDT
72-0240 72-0595
DDT derived compounds
72-0595
DDT isomers
72-0595
Fluoroacetamide
72-0588
PCP
72-0240
Sodium chlorate
72-0134
Soman
72-0620
2,4-D
72-0118

Drosophila
2,4,5-T
72-0130

Duck
72-0117
DDT
72-0186
DDT derived compounds
72-0206

Earthworm
DDT isomers
72-0177
TDE
72-0177

Fish
Azinphosmethyl
72-0606
Chlorothalonil
72-0159
Dalapon-Na
72-0127
Danifos
72-0159
Dodine
72-0159
DDT
72-0135 72-0190
72-0346
Endosulfan
72-0160
Endrin
72-0166 72-0579
Kitazin-P
72-0159
Parathion
72-0606
PCP
72-0159
Thiram
72-0159

Frog
Cartap derived compounds
72-0124

Dichlormate
72-0388
Dieldrin
72-0644
Endrin
72-0644
EPTC
72-0388
Molinate
72-0388
Pebulate
72-0388
TCDD
72-0273
Vernolate
72-0388
Spinach
72-0243 72-0450
Straw
Tridemorph
72-0479
Strawberries
Aldrin
72-0450
BHC
72-0450
Dieldrin
72-0450
DDT
72-0450
Endrin
72-0450
EPN
72-0450
Malathion
72-0450
Omite
72-0641
Parathion
72-0450
Polycarbazine
72-0305
Zineb
72-0305
Sugar Products
Aldrin
72-0313
Chlordane
72-0313
Heptachlor
72-0313
Sugarbeet
Cycloate
72-0317
Delachlor
72-0317
Diallate
72-0317
Endothall
72-0317
Pyrazon
72-0317
Summer orange
Aldrin
72-0450
BHC
72-0450
Dieldrin
72-0450
DDT
72-0450
Endrin
72-0450
EPN
72-0450
Malathion
72-0450
Parathion
72-0450
Tea
Chlorobenzilate
72-0470
Chloropropylate
72-0470
Tomatoes
Aldrin
72-0450
BHC
72-0450
Carbofuran
72-0386
Dieldrin
72-0450
Diphenamid
72-0458
DDT
72-0450
Endrin
72-0450
EPN
72-0450
Malathion
72-0450
Parathion
72-0450
Total diet
Aldrin
72-0036
Bromides
72-0036
Carbaryl
72-0036
Dichlorvos
72-0036
Dicofol
72-0036
Dieldrin
72-0036
DDT
72-0036
Endrin
72-0036
Heptachlor
72-0036
Lindane
72-0036
Malathion
72-0036
Parathion
72-0036
Turkey
Dursban
72-0575
Veal
DDT
72-0283
DDT derived
compounds
72-0283
TDE
72-0283
Vegetables
Aldrin
72-0451
BHC
72-0451
Chlorobenzilate
72-0470
Chloropropylate
72-0470
DDT
72-0283 72-0451
DDT derived
compounds
72-0283
Mercury
72-0451
Menazon
72-0110
TDE
72-0283
Walnuts
Omite
72-0641
Welsh onion
72-0450
Wheat
Carbamates
72-0055
Maneb
72-0055
MCP
72-0282

Chlorfenvinphos
72-0165
Chlorobenzilate
72-0470
Chloropropylate
72-0470
Copper sulfate
72-0568
Coumaphos
72-0376
Crotoxyphos
72-0165
Dasanit
72-0376
Delnav
72-0376
Demeton
72-0376
Demeton methyl
72-0215
Dichlorvos
72-0165
Dicrotophos
72-0165
Dicumarol
72-0168
Dieldrin
72-0240 72-0362
72-0358 72-0600
Dieldrin derived compounds
72-0600
Dimethoate
72-0215 72-0376
Disulfoton
72-0376
DDT
72-0116 72-0240
72-0340 72-0350
72-0362 72-0584
DDT derived compounds
72-0350
DFP
72-0145 72-0377
72-0610
EDEMS
72-0361
EPN
72-0376
Ethion
72-0376
O-Ethyl-S-(2-dimethylaminoethyl) methylthiophosphonat
72-0590
Fenitrothion
72-0373
Folex
72-0376
Guthion
72-0376
Heptachlor
72-0373 72-0565
Herbicides
72-0157
Lead
72-0350
Malathion
72-0215
Mancozeb
72-0558
Maneb
72-0558
Menazon
72-0110
Methyl demeton
72-0376
Methyl parathion
72-0376
Mevinphos
72-0165 72-0215
Monocrotophos
72-0165
OMPA
72-0376
Paraoxon
72-0165 72-0173
72-0610
Parathion
72-0108 72-0116
72-0215 72-0376
72-0610
Phencapton
72-0128
Phosdrin
72-0376
Phosphamidon
72-0359
Polychlorinated biphenyls
72-0018
PCP
72-0240
PMFP
72-0361
PNMC
72-0373
Ronnel
72-0376
Sarin
72-0610 72-0618
Soman
72-0145 72-0590
72-0610 72-0620
SD-14045
72-0165
Tabun
72-0610
Trimethylphosphate
72-0371
Trithion
72-0376
TEPA
72-0371
WL-22864
72-0165
Zineb
72-0558
2,4,5-T
72-0431
Sheep
Fluoroacetamide
72-0341 72-0588
72-0589
Silkworm
Carbaryl
72-0594
Snail
DDT
72-0191
Sparrow
72-0117
Squid
Allethrin
72-0148
Pyrethrins
72-0148
Toad
DDT
72-0604
Toxicity/Humans
General
72-0019 72-0035
72-0335 72-0445
72-0549
Organochlorines
72-0472
Polychlorinated biphenyls
72-0472
Aldrin
72-0240 72-0244
Arsenicals
72-0332
Blasticidan-S
72-0517
BHC
72-0240 72-0557
Carbamates
72-0095
Chlordane
72-0554
Chlorodibenzo-p-dioxin
72-0092

Coumatetralyl
72-0429
Demeton
72-0237
Dichlorvos
72-0551
Dieldrin
72-0240 72-0244
72-0557
DDT
72-0237 72-0240
72-0244 72-0247
72-0252 72-0423
72-0506 72-0517
72-0522 72-0554
72-0557
DDT derived compounds
72-0557
Endosulfan
72-0244
Endrin
72-0244
Heptachlor
72-0244
Insecticides
72-0003
Lindane
72-0237 72-0244
72-0554
Malathion
72-0090 72-0091
72-0237
Mercurials
72-0098 72-0332
Methyl parathion
72-0237
Methyl Bromide
72-0510
Methylene chloride
72-0104
MNFA
72-0505
Organochlorines
72-0332
Organophosphates
72-0088 72-0090
72-0102 72-0194
72-0518 72-0522
72-0552
Paraquat
72-0217
Parathion
72-0138 72-0520
72-0554
Picloram
72-0092
Polychlorinated biphenyls
72-0251
PCP
72-0240 72-0522
Schradan
72-0237
Silvex
72-0092
Sodium arsenite
72-0237
TDE
72-0244
TMTD
72-0519
Warfarin
72-0429
Xylene
72-0091
Zinc phosphide
72-0237
2,4-D
72-0092 72-0522
2,4,5-T
72-0092 72-0252
72-0431
Accidental
Arsenicals
72-0323 72-0607
BHC
72-0441
Disulfoton
72-0087
DDT
72-0086 72-0441
Endrin
72-0086 72-0441
Lindane
72-0086 72-0087
72-0441
Malathion
72-0087 72-0093
Mercurials
72-0086 72-0536
Methyl Bromide
72-0507
Mevinphos
72-0087
Organofluorines
72-0086
Organophosphates
72-0084 72-0101
Paraquat
72-0321 72-0504
72-0526 72-0537
Parathion
72-0086 72-0087
72-0512
Polychlorinated biphenyls
72-0018
Strychnine
72-0087
Trichlorfon
72-0543
Warfarin
72-0087
Experimental
Carboxide
72-0158
Pralidoxime
72-0196
Intentional
BHC
72-0441
Carbaryl
72-0585
Dieldrin
72-0532
DDT
72-0441
DFP
72-0585
Endrin
72-0441
Eserine
72-0585
Lindane
72-0441
Malathion
72-0096 72-0097
72-0585
O-Ethyl-S-(2-diethylaminoethyl) methylthiophosphonat
72-0585
O-Ethyl-S-(2-dimethylaminoethyl) methylthiophosphonat
72-0585
Paraquat
72-0103 72-0319
72-0544
Soman
72-0585
Trichlorfon
72-0543
TDE
72-0131
TEPP
72-0585
1-Naphthyldimethylcarb
72-0585
Occupational
72-0012 72-0336
72-0549
Aldrin
72-0083 72-0243

Aminocarb
72-0243
Azinphos ethyl
72-0243
Azinphos methyl
72-0243
Bordeaux mixture
72-0568
Bromophos
72-0243
BHC
72-0557
Carbaryl
72-0243
Carbophenothion
72-0243
Chlordane
72-0554
Chlorfenvinphos
72-0243
Copper sulfate
72-0568
Demeton
72-0243
Dichlorvos
72-0243
Dicrotophos
72-0243
Dieldrin
72-0243 72-0509
72-0557
Difolatan
72-0515
Dimethoate
72-0243
Disulfoton
72-0087 72-0243
Dyrene
72-0516
DDT
72-0243 72-0509
72-0533 72-0546
72-0554 72-0557
DDT derived compounds
72-0449 72-0533
72-0557
Endosulfan
72-0243
Endrin
72-0243
Ethion
72-0243
Ethoate-methyl
72-0243
Fenitrothion
72-0243
Fensulfothion
72-0243
Fenthion
72-0243
Formothion
72-0243
Gardona
72-0527
Heptachlor
72-0243 72-0509
Lead arsenate
72-0243
Lindane
72-0087 72-0243
72-0554
Malathion
72-0087
Maldison
72-0243
Menazon
72-0243
Metham
72-0550
Methiocarb
72-0243
Methomyl
72-0243
Methyl parathion
72-0243 72-0548
Methyl Bromide
72-0237 72-0507
Methyl Parathion
72-0509
Mevinphos
72-0087 72-0243
Monocrotophos
72-0243
MCPA
72-0082
Naled
72-0243
Organochlorines
72-0089 72-0513
Organophosphates
72-0084 72-0085
72-0099 72-0325
72-0440 72-0508
72-0513 72-0514
Parathion
72-0087 72-0243
72-0337 72-0509
72-0512 72-0514
72-0528 72-0548
72-0554
Phenthoate
72-0243
Phorate
72-0243
Phosalone
72-0243
Phosdrine
72-0509
Phosmet
72-0243
Phosphamidon
72-0243
Pyrethrum
72-0243
Rotenone
72-0243
Strychnine
72-0087
Thiometon
72-0243
Thionazin
72-0243
Trichlorfon
72-0243 72-0547
Trichloronate
72-0243
TDE
72-0243
TEPP
72-0243
Warfarin
72-0087
Zineb
72-0545
2,4-D
72-0083
2,4,5-T
72-0083
Toxicity/Wildlife
General
72-0019 72-0539
organochlorines
72-0472
polychlorinated biphenyls
72-0472
Demeton
72-0237
DDT
72-0013 72-0237
72-0241 72-0252
72-0423
Endosulfan
72-0320
Herbicides
72-0020
Lindane
72-0237
Malathion
72-0237
Methyl parathion
72-0237
Polychlorinated biphenyls
72-0320

Schradan
72-0237
Sodium arsenite
72-0237
Zinc phosphide
72-0237
2,4,5-T
72-0252
Birds
Aldrin
72-0198 72-0199
72-0240 72-0243
72-0244
Aminocarb
72-0243
Azinphos ethyl
72-0243
Azinphos methyl
72-0243
Bromophos
72-0243
BHC
72-0240
Carbaryl
72-0243
Carbophenothion
72-0243
Chlorfenvinphos
72-0243
Chlorobenzilate
72-0470
Chloropropylate
72-0470
Demeton
72-0237 72-0243
Dichlorvos
72-0243
Dicrotophos
72-0243
Dieldrin
72-0100 72-0198
72-0199 72-0240
72-0243 72-0244
72-0278 72-0324
Dimethoate
72-0243
Disulfoton
72-0243
Dursban
72-0575
DDT
72-0100 72-0186
72-0198 72-0237
72-0240 72-0243
72-0244 72-0246
72-0278 72-0320
72-0599
DDT derived compounds
72-0198 72-0206
72-0329 72-0599
Endosulfan
72-0243 72-0244
Endrin
72-0243 72-0244
Ethion
72-0243
Ethoate-methyl
72-0243
Fenitrothion
72-0243
Fensulfothion
72-0243
Fenthion
72-0243
Formothion
72-0243
Heptachlor
72-0243 72-0244
Heptachlor epoxide
72-0278
Herbicides
72-0002
Lead arsenate
72-0243
Lindane
72-0198 72-0237
72-0243 72-0244
Malathion
72-0237
Maldison
72-0243
Menazon
72-0243
Mercurials
72-0025 72-0540
72-0541
Methiocarb
72-0243
Methomyl
72-0243
Methyl parathion
72-0237 72-0243
Mevinphos
72-0243
Monocrotophos
72-0243
Naled
72-0243
Organochlorines
72-0027 72-0571
Panogen
72-0178
Paraquat
72-0061
Parathion
72-0200 72-0243
Phenthoate
72-0243
Phorate
72-0243
Phosalone
72-0243
Phosmet
72-0243
Phosphamidon
72-0243
Picloram
72-0285
Polychlorinated biphenyls
72-0189 72-0198
72-0366 72-0444
Pyrethrum
72-0243
PCP
72-0240
Rotenone
72-0243
Schradan
72-0237
Sodium arsenite
72-0237
Thiometon
72-0243
Thionazin
72-0243
Trichlorfon
72-0243
Trichloronate
72-0243
TDE
72-0198 72-0243
72-0244
TEPP
72-0243
Zinc phosphide
72-0237
2,4,5-T
72-0285
Fish/Aquatic/Marine life
Abate
72-0334
Aldicarb
72-0369
Aldrin
72-0175 72-0240
72-0243 72-0244
72-0376
Alorin
72-0352
Aminocarb
72-0243
Azinphos ethyl
72-0243

Azinphos methyl
72-0230 72-0243
72-0369
Bromophos
72-0243
BHC
72-0240
Carbaryl
72-0187 72-0243
72-0369
Carbofuran
72-0369
Carbophenothion
72-0243
Chlordane
72-0376
Chlorfenvinphos
72-0243
Chlorobenzilate
72-0470
Chloropropylate
72-0470
Demeton
72-0237 72-0243
Diazinon
72-0230 72-0334
Dichlorvos
72-0243
Dicofol
72-0376 72-0562
72-0603
Dicrotophos
72-0243 72-0369
Dieldrin
72-0175 72-0195
72-0240 72-0243
72-0244
Dielorin
72-0352
Dimethoate
72-0243
Disulfoton
72-0243
Dursban
72-0334 72-0369
DDT
72-0153 72-0175
72-0237 72-0240
72-0243 72-0244
72-0246 72-0370
72-0376 72-0562
72-0577 72-0603
DDT derived compounds
72-0175
DDT isomers
72-0376
Endosulfan
72-0160 72-0243
72-0244 72-0562
72-0603
Endrin
72-0105 72-0187
72-0243 72-0244
72-0376 72-0579
Ethion
72-0243
Ethoate-methyl
72-0243
Ethoxychlor
72-0577
Fenitrothion
72-0243
Fensulfothion
72-0243
Fenthion
72-0243 72-0334
Formothion
72-0243
Heptachlor
72-0243 72-0244
72-0352 72-0376
Heptachlor epoxide
72-0376
Herbicides
72-0002
Isodrin
72-0352
Kerosene
72-0330
Lead arsenate
72-0243
Lindane
72-0237 72-0243
72-0244
Malathion
72-0195 72-0237
72-0369
Maldison
72-0243
Menazon
72-0243
Mercurials
72-0098
Methiocarb
72-0243
Methomyl
72-0243 72-0369
Methoxychlor
72-0195 72-0577
Methyl parathion
72-0237 72-0243
72-0369
Mevinphos
72-0243
Monocrotophos
72-0243 72-0369
Naled
72-0243
Organochlorines
72-0027
Paraquat
72-0061
Parathion
72-0230 72-0243
72-0370
Phenthoate
72-0243
Phorate
72-0230 72-0243
Phosalone
72-0243
Phosmet
72-0243
Phosphamidon
72-0243
Picloram
72-0285
Polychlorinated biphenyls
72-0018 72-0251
Pyrethrum
72-0243
PCP
72-0240
Rotenone
72-0195 72-0243
Schradan
72-0237
Sodium arsenite
72-0237
Thiometon
72-0243
Thionazin
72-0243
Toxaphene
72-0370
Trichlorfon
72-0243
Trichloronate
72-0243
TDE
72-0243 72-0244
72-0376
TEPP
72-0243
Zinc phosphide
72-0237
2,4-D
72-0094
2,4,5-T
72-0285
Mammals
Aldrin
72-0243

Aminocarb
72-0243
Azinphos ethyl
72-0243
Azinphos methyl
72-0243
Bromophos
72-0243
Carbaryl
72-0243
Carbophenothion
72-0243
Chlorfenvinphos
72-0243
Demeton
72-0243
Dichlorvos
72-0243
Dicrotophos
72-0243
Dieldrin
72-0243
Dimethoate
72-0243
Disulfoton
72-0243
DDT
72-0243
Endosulfan
72-0243
Endrin
72-0243
Ethion
72-0243
Ethoate-methyl
72-0243
Fenitrothion
72-0243
Fensulfothion
72-0243
Fenthion
72-0243
Formothion
72-0243
Heptachlor
72-0243
Herbicides
72-0002
Lead arsenate
72-0243
Lindane
72-0243
Malathion
72-0243
Menazon
72-0243
Mercurials
72-0541
Methiocarb
72-0243
Methomyl
72-0243
Methyl parathion
72-0243
Mevinphos
72-0243
Monocrotophos
72-0243
MNPA
72-0565
Naled
72-0243
Parathion
72-0243
Phenthoate
72-0243
Phorate
72-0243
Phosalone
72-0243
Phosmet
72-0243
Phosphamidon
72-0243
Picloram
72-0285
Pyrethrins
72-0253
Pyrethrum
72-0243
Rotenone
72-0243
Sodium floroacetate
72-0025
Thallium
72-0025
Thiometon
72-0243
Thionazin
72-0243
Trichlorfon
72-0243
Trichloronate
72-0243
TDE
72-0243
TEPP
72-0243
Zinc phosphide
72-0025
2,4,5-T
72-0285
Treatment of Poisoning
General
Organophosphates
72-0085 72-0440
72-0518 72-0552
Propylene oxide
72-0184
Trichlorfon
72-0543
Acetamide
Fluoroacetamide
72-0341
MNPA
72-0565
Activated carbon
Dieldrin
72-0611
Aminobolic wafers
Thallium
72-0553
Ampicillin
Paraquat
72-0537
Artifical Respiration
Parathion
72-0086
Atropine
Carbamates
72-0095
Malathion
72-0090 72-0093
72-0096 72-0143
Organophosphates
72-0088 72-0090
72-0101 72-0102
72-0143
Parathion
72-0086 72-0520
Soman
72-0620
Trichlorfon
72-0543 72-0547
Benactyzine
Soman
72-0620
Bentonite gel
Paraquat
72-0537
p,p'-Bis-(pyridinium-4-aldoxime acetyl biphenyl bromide
72-0167
syn,syn-1,4-Bis(pyridinium-4-carbaldoxime acetyl benz
72-0167
Boric acid
Thallium
72-0553
Zineb
72-0545
BAL
Mercurials
72-0536

Cho-Meth
Thallium
72-0553
Cholinesterase Activators
Soman
72-0620
Combiotic
Thallium
72-0553
Corticosteroids
DDT
72-0546
Decontamination
Malathion
72-0096
Desensitizers
DDT
72-0546
Zineb
72-0545
Dexamethasone
Paraquat
72-0537
Dextrose
Paraquat
72-0103 72-0537
72-0544
Thallium
72-0553
Dialysis
DDT derived compounds
72-0326
Paraquat
72-0319
Dimercaprol
Arsenicals
72-0607
Diphenylthiocarbazone
Thallium
72-0553
Dipyroxime
Organophosphates
72-0183
Diuresis
Paraquat
72-0217
Emesis
Paraquat
72-0321
Enterolyte
Thallium
72-0553
Flumethasone
Thallium
72-0553
Forced diuresis
Paraquat
72-0319 72-0321
72-0537
Frusemide
Paraquat
72-0537
Furosemide
Paraquat
72-0544
Gastric lavage
Paraquat
72-0537 72-0544
Glucose
MNFA
72-0565
Glutathione
Methyl Bromide
72-0510
Hexacyanoferrates (II)
Thallium
72-0556
Intensive care
Malathion
72-0097
Jenotone
Thallium
72-0553
Kaobiotic
Thallium
72-0553
Lactate
Paraquat
72-0544
Lipotropic agents
DDT derived compounds
72-0615
Mannitol
Paraquat
72-0103
Peritoneal Dialysis
Paraquat
72-0504
Metaraminol
Parathion
72-0520
Monoacetin
Fluoroacetamide
72-0341
MINA
DFP
72-0145
Soman
72-0145
Nutrical
Thallium
72-0553
Obidoxime chloride
DFP
72-0145
Soman
72-0145
Optisone
Thallium
72-0553
Oxime
Methyl Bromide
72-0510
Oxygen
Paraquat
72-0526
OA3
DFP
72-0145
Soman
72-0145
Percutaneous catheter
Paraquat
72-0537
Phenobarbital
Dieldrin
72-0611
Potassium permanganate
Zineb
72-0545
Pralidoxime
72-0167
Malathion
72-0090 72-0096
Organophosphates
72-0090 72-0102
Pralidoxime methanesulfonate
DFP
72-0145
Soman
72-0145
Prednisolone
Paraquat
72-0544
Pyridine aldoxime
Parathion
72-0520
Replacement transfusion
Paraquat
72-0537
Ringer solution
Thallium
72-0553
Rivanol
Zineb
72-0545
Saline
Paraquat
72-0103 72-0544

Sedatives
Zineb
72-0545
Steroids
Paraquat
72-0544
Sustrope
Thallium
72-0553
Toxogonin
DFP
72-0610
Paraoxon
72-0610
Parathion
72-0610
Sarin
72-0610
Soman
72-0610
Tabun
72-0610
Trimedoxime bromide
DFP
72-0145
Soman
72-0145
TMB-4
72-0167
Vitamin B-complex
Thallium
72-0553
2-PAM
DFP
72-0610
Paraoxon
72-0610
Parathion
72-0610
Sarin
72-0610
Soman
72-0610
Tabun
72-0610

AUTHOR INDEX

I. PERSONAL AUTHOR INDEX

Abbott, D.C.
72-0409
Abe, A.
72-0237
Abernathy, C.O.
72-0338
72-0339
Abernathy, J.R.
72-0051
Ackermann, H.
72-0476
Adamczyk, E.
72-0374
Adamovic, V.
72-0169
Adamson, R.H.
72-0163
Adler, I.D.
72-0371
Aggarwal, S.
72-0187
Aguesse, P.
72-0489
Ahlrichs, J.L.
72-0503
Ahmad, S.
72-0174
Ainardi, V.R.
72-0561
Akkermans, L.M.A.
72-0604
Aldridge, W.N.
72-0136
72-0146
Alexa, L.
72-0287
Alexander, M.
72-0056
Alford, A.
72-0225
Allan, G.G.
72-0309
Allen, M.G.
72-0001
Aly, O.M.
72-0628
Ambrono, V.
72-0519
Anderson, J.P.E.
72-0457
72-0591
Antonelli, C.
72-0228
Antonovich, E.A.
72-0452
Aragones, R.
72-0608
Araki, S.
72-0237
Arimatsu, Y.
72-0515
Aristenko, V. G.
72-0204
Arnan, A.
72-0003
Arnold, E.
72-0111
Arnott, D. R.
72-0316
Asano, S.
72-0159
Astolfi, E.
72-0557
Atsumi, K.
72-0517
Audus, L.J.
72-0071
Aue, W.A.
72-0625
Aulerich, R.J.
72-0312
Axley, J.H.
72-0486

Badurski, J.
72-0532
Bagby, Jr., J.R.
72-0087
Bails, R.
72-0504
Baines, R.C.
72-0292
Bajgar, J.
72-0585
72-0590
Baldwin, M.K.
72-0600
Baluja Marcos, G.
72-0074
Bank, H.
72-0238
Bardiya, M.C.
72-0107
Barfknecht, C.F.
72-0167
Baron, R.L.
72-0357
72-0115
Barthel, W.F.
72-0058
72-0536
Bartsch, E.
72-0470
Bastone, V.B.
72-0357
72-0115
Batterton, J.C.
72-0347
Baxter, W.L.
72-0200
Beard, W.E.
72-0485
Becker, A.
72-0207
Becker, K.
72-0429
Becking, G.C.
72-0350
Bedford, J.W.
72-0268
Beebeejaum, A.R.
72-0544
Beevers, G.
72-0544
Begliomini, A.
72-0477
Belamie, R.
72-0489
Belan, A.A.
72-0158
Belayeva, V.H.
72-0184
Belisle, A.A.
72-0329
Bencivelli, A.
72-0073
Bend, J.R.
72-0342
Bennett, G.W.
72-0239
Benson, W.W.
72-0099
van Benthem, R.M.J.
72-0145
Bentivogli, P.G.
72-0073
Benville, Jr., P.E.
72-0258
Benz, F.W.
72-0167
van den Bercken, J.
72-0604
Berger, H.
72-0476
Bergmann, E.D.
72-0434
Berry, D.J.
72-0217
Bert, M.H.
72-0168
Beug, W.M.
72-0561
Bevenue, A.
72-0220
72-0416
Bibard, G.
72-0048
72-0080
Bibb, T.L.
72-0602
Biernaux, J.
72-0493
Bikbulatova, L.I.
72-0082
Bindra, O.S.
72-0297
Biros, F.J.
72-0487
72-0630
Bishop, Y.
72-0111
Bitman, J.
72-0152
72-0616
Bixby, M.W.
72-0277
Bjerke, E.L.
72-0447
Blanchfield, B.J.
72-0396
Blazquez, C.H.
72-0318
Blinn, R.C.
72-0627
Blumenbach, D.
72-0019
Blus, L.J.
72-0329
Bodnar, J.
72-0519
Boehme, C.
72-0582
Boerner, H.
72-0290
Bohn, G.
72-0651
Bollen, W.B.
72-0059
Bolton, G.C.
72-0058
Bond, J.
72-0197
Bonderman, D.P.
72-0083
Bonnell, M.L.
72-0308
Bonner, F.L.
72-0324

Booth, G.M.
72-0133
Born, G.S.
72-0227
Borum, D.W.
72-0216
Boush, G.M.
72-0277
72-0347
Bovard, K.P.
72-0176
Bovey, R.W.
72-0054
72-0285
Bowen, I.D.
72-0648
Bowman, M.C.
72-0274
Bradley, J.R.
72-0296
Bradley, Jr., R.L.
72-0475
Brady, U.E.
72-0267
Branisteanu, D.
72-0519
Briggs, G.G.
72-0045
Brodie, R.E.
72-0108
Brooks, R.E.
72-0619
Brown, H.W.
72-0099
72-0528
Brown, S.S.
72-0526
Brown, W.H.
72-0281
Bruce-Chwatt, L.J.
72-0004
Buchel, L.
72-0542
Budczies, B.
72-0582
Bugg, Jr., J.C.
72-0062
Bullock, D.H.
72-0316
Bunyan, P.J.
72-0113
Burke, J.A.
72-0395
Burnett, R.
72-0455
Burns, R.G.
72-0076
Butler, L.I.
72-0386
72-0495
Byrd, B.C.
72-0447

Cahill, W.P.
72-0264
72-0279
Callenbach, J.A.
72-0017
Campbell, R.S.
72-0175
Canale, G.
72-0642
Carman, G.E.
72-0464
Carter, F.L.
72-0369
Caseley, J.C.
72-0033
Casida, J.E.
72-0123
72-0149
Casper, V.L.
72-0062
Casterline, Jr., J.L.
72-0108
Castro, C.E.
72-0292
Castro, T.F.
72-0269
Cavagna, G.
72-0551
Cecil, H.C.
72-0152
Cesari, A.
72-0073
Chambers, H.
72-0105
Champion, D.F.
72-0484
Chandran, S.R.
72-0352
Chang, F.Y.
72-0354
72-0355
Chang. Y.L.
72-0275
Charvat, J.
72-0436
Chau, A.S.Y.
72-0623
Chen, G.
72-0381
Cheng, E.Y.
72-0376
Chesters, G.
72-0027
Chevallier, C.
72-0490
72-0491
72-0492
Chevrel, B.
72-0621
Childers, J.R.
72-0216
Chisholm, D.
72-0302
Chodkowski, J.
72-0502
Cholas, G.
72-0087
Cholas, P.H.
72-0087
Chopra, C.S.
72-0309
Choudhury, S.R.
72-0173
Chow, A.
72-0633
Chow, C.
72-0282
Chow, W.
72-0380
Chu, J.P.
72-0227
Cibes-Viade H.
72-0468
Cibes-Viade, H.R.
72-0079
Claborn, J.C.
72-0411
Clark, G.
72-0194
Clay, D.V.
72-0070
Cliath, M.M.
72-0257
Cloutier, G.
72-0363
Clyne, R.M.
72-0102
Coats, J.R.
72-0577
Cochrane, W.P.
72-0623
Coggins, Jr., C.W.
72-0462
Colas, A.
72-0404
Colberg, W.J.
72-0017
Cole, A.F.W.
72-0075
Collier, C.W.
72-0644
Collins, D.J.
72-0162
Collins, T.F.X.
72-0345
Cooke, A.S.
72-0114
Coon, J.M.
72-0181
Coppage, D.L.
72-0230
Cornet, R.
72-0490
Coult, D.B.
72-0375
Cousserans, J
72-0492
Coutselinis, A.
72-0215
Cox, E.L.
72-0036
Cox, J.L.
72-0307
Craig, P.P.
72-0246
Cranmer, M.F.
72-0527
Creger, C.R.
72-0615
Crosby, D.G.
72-0270
Csieleszky, V.
72-0372
Cutkomp, L.K.
72-0376

Daevring, L.
72-0130
Dahlgren, R.B.
72-0189
Dalgaard-Mikkelsen, S.
72-0482
Danilenko, L.P.
72-0183
72-0518
Daris, B.T.
72-0069
Dashev, G.
72-0558
Dauterman, W.C.
72-0122
Davidson, J.M.
72-0051
Davies, J.D.
72-0121
Davis, B.N.K.
72-0177

Davis, F.C.
72-0633
Davis, P.W.
72-0562
72-0603
Davison, D.L.
72-0611
Davydov, G.M.
72-0158
Day, B.E.
72-0232
De Hamel, F.A.
72-0101
Decker, W.J.
72-0499
Dedek, W.
72-0453
Dedov, V.S.
72-0158
Deguchi, T.
72-0124
Deichmann, W.B.
72-0365
72-0557
De Lacy, T.P.
72-0636
Delak, M.
72-0169
Delvaux, E.L.
72-0659
Deshmukh, S.N.
72-0297
Desi, I.
72-0372
72-0378
Devine, J.M.
72-0641
Dewan, R.S.
72-0298
Dewey, J.E.
72-0425
Dexter, A.
72-0016
DeLacy, T.P.
72-0636
DeLoach, H.K.
72-0300
Dicks, J.S.
72-0209
Dicowsky, L.
72-0348
Dimopoulos, G.
72-0215
Dindal, D.L.
72-0191
Dinman, B.D.
72-0088
Djavaherian, M.
72-0613
Dockter, M.M.
72-0581
Donald, K.W.
72-0526
Donaldson, W.E.
72-0170
Done, A.K.
72-0607
Donninger, C.
72-0147
Doro, B.
72-0060
Dorough, H.W.
72-0461
72-0463
72-0498
Douch, P.G.C.
72-0559
72-0560
Dousse, R.
72-0207
Dremova, V.P.
72-0158
Drescher, N.
72-0479
Duerr, F.
72-0319
Duggan, R.E.
72-0036
Duke, T.W.
72-0039
Durcek, K.
72-0373
Dusch, M.E.
72-0271
Dutt, G.R.
72-0261
DuBois, K.P.
72-0143
72-0367
Dvorak, P.
72-0556
Dyment, P.G.
72-0280
72-0499

Earnest, R.D.
72-0258
Eberle, D.
72-0470
Eberle, D.O.
72-0392
Edwards, C.A.
72-0201
Edwards, R.
72-0472
Egan, H.
72-0397
Egyed, M.N.
72-0341
72-0588
72-0589
El-Dib, M.A.
72-0391
El-Mokadem, M.T.
72-0574
Elgar, K.E.
72-0631
Eller, L.L.
72-0166
Elliott, M.
72-0149
Elvidge, D.A.
72-0415
Engebretson, K.A.
72-0611
Engelhardt, G.
72-0454
Epstein, E.
72-0483
Epstein, S.S.
72-0111
72-0371
72-0445
Ercegovich, C.D.
72-0632
Ershova, E.A.
72-0518
Erwin, D.C.
72-0216
Estesen, B.J.
72-0264
Everett, R.E.
72-0575
Evreev, V.N.
72-0518
Eyl, T.B.
72-0098

Fabacher, D.L.
72-0105
Fabro, S.
72-0163
Fang, S.C.
72-0387
Faust, S.D.
72-0628
72-0639
Fechner, G.
72-0476
Feil, V.J.
72-0356
Fekete, M.
72-0377
Felbeck, Jr., G.T.
72-0249
Feledyk, K.
72-0364
Fellig, J.
72-0381
Filipiuc, M.
72-0287
Fimreite, N.
72-0178
Fisher, H.K.
72-0504
Fisher, N.S.
72-0467
Fitak, B.
72-0502
Fitzhugh, O.G.
72-0118
Fleeker, J.
72-0042
Flenley, D.C.
72-0526
Fletcher, C.E.
72-0225
Flynt, T.O.
72-0054
Foehrenbach, J.
72-0259
Foschi, S.
72-0073
Fontenot, J.P.
72-0176
Ford, J.H.
72-0058
Formica, G.
72-0392
Fowler, J.F.
72-0324
Fowler, J.S.L.
72-0584
Fravolini, A.
72-0477
Frawley, J.P.
72-0376
Freed, V.H.
72-0275
French, M.C.
72-0656
Friedman, M.A.
72-0111
Friend, M.
72-0186
Fries, G.F.
72-0152
72-0596
72-0616
Fromm, P.O.
72-0195

Froslie, A.
72-0598
Fuhremann, T.W.
72-0037
Fujiwara, S.
72-0420
Fukuto, T.R.
72-0137
Fulton, D.B.
72-0537
Funnell, H.S.
72-0316
Fusi, P.
72-0228

Gabica, J.
72-0099
Gaines, J.L.
72-0062
Gal, S.
72-0413
Galston, A.W.
72-0006
Gantenbein, W.M.
72-0383
Garssen-Hoekstra, J.
72-0540
Gascon, A.L.
72-0363
Gaskin, D.E.
72-0044
Gaunt, J.K.
72-0162
Gaur, A.C.
72-0107
72-0205
Geike, F.
72-0402
Geissbuhler, H.
72-0068
van Genderen, H.
72-0571
Georgacakis, E.
72-0352
Gerlach, E.R.
72-0248
Gesser, H.D.
72-0633
Getz, M.E.
72-0629
Getzin, L.W.
72-0106
Gevat, V.
72-0287
Gil, I.
72-0608
Gillette, R.
72-0247
Giovanoli-Jakubczak, T.
72-0502
Gish, C.D.
72-0329
Gladenko, V.I.
72-0155
de Goeij, J.J.M.
72-0540
Gomes, E.D.
72-0280
72-0499
Gonzalez–Ibanez, J.
72-0079
Gorbacheva, N.A.
72-0654
Gordini, T.
72-0649
Gordon, C.H.
72-0596
Gorner, F.
72-0448
Gotal, J.P.
72-0169
Goto, J.
72-0517
Goulding, R.
72-0332
de Graaf, J.B.H.D.
72-0403
Grasso, T.
72-0442
Graves, J.B.
72-0324
Greichus, Y.A.
72-0199
Greve, P.A.
72-0034
72-0480
Grice, R.E.
72-0030
Grieve, D.G.
72-0316
Grimanis, A.P.
72-0069
Grissinger, E.H.
72-0058
Groff, W.A.
72-0196
Grove, J.
72-0217
Grunow, W.
72-0582
Guardigli, A.
72-0380
Guenzi, W.D.
72-0485
Gundu Rao, G.R.
72-0647
Gunner, H.B.
72-0311
Gunther, F.A.
72-0271
72-0392
72-0464
Gupta, D.S.
72-0410
Gutenmann, W.H.
72-0360
Guth, J.A.
72-0068
Guthrie, F.E.
72-0338
72-0339
Gutsche, B.
72-0646

Haas, H.G.
72-0124
Habermann, R.T.
72-0118
Haegele, M.A.
72-0117
Hagedorn, D.J.
72-0032
Hahn, S.
72-0479
Hall, E.T.
72-0385
Hall, J.E.
72-0199
Halmi, K.A.
72-0131
Hamadmad, N.
72-0270
Hambrook, J.L.
72-0046
Hammerstrom, R.J.
72-0062
Hammond, A.L.
72-0432
Handa, S.K.
72-0276
72-0298
Hansen, W.H.
72-0118
Hanss, M.
72-0222
Haque, R.
72-0161
72-0640
Hara, A.
72-0530
72-0531
72-0586
72-0587
Harris, C.R.
72-0262
72-0266
Hart, M.M.
72-0163
Hascoet, M.
72-0284
Hashimoto, Y.
72-0505
72-0565
Hastings, F.L.
72-0122
Haufe, W.O.
72-0040
72-0041
Hawthorne, J.C.
72-0058
Hayes, Jr., W.J.
72-0089
Hayes, M.H.B.
72-0030
Head, W.K.
72-0303
Heard, B.E.
72-0526
Heath, R.G.
72-0329
Heatwole, R.E.
72-0036
Heberston, L.M.
72-0280
72-0499
Hecht, Y.
72-0621
Heidker, J.C.
72-0614
Hekmati, M.
72-0475
Helling, C.S.
72-0398
72-0399
72-0400
Hemken, R.W.
72-0498
Hemphill, D.D.
72-0300
Hensel, G.
72-0319
Herfs, W.
72-0438
Hermes, P.A.
72-0223
Herrmann, R.
72-0646
Herzel, F.
72-0160
72-0465
72-0466

Author Index

Hess, C.
72-0578
Hethelyi, E.
72-0652
Heyndrickx, A.
72-0601
Hicks, B.W.
72-0463
Higer, A.L.
72-0265
Hill, K.R.
72-0299
Hine, C.H.
72-0103
Hinman, A.R.
72-0536
Hirst, E.
72-0238
Hirwe, A.S.
72-0151
72-0577
Hodgson, E.
72-0164
72-0338
72-0339
Hodgson, R.H.
72-0050
Hoffman, G.O.
72-0066
Hoffman, I.
72-0075
Hoffmann, D.
72-0132
Holan, G.
72-0150
Holder, G.M.
72-0342
Holdrinet, M.
72-0044
Hollingworth, R.M.
72-0142
Holmstedt, B.
72-0138
van Holsteyn, C.W.M.
72-0366
Holt, R.F.
72-0394
van Hoof, F.
72-0601
Hori, S.
72-0592
72-0593
Horiba, M.
72-0420
Horie, E.
72-0517
Hornabrook, R.W.
72-0280
Hotya, J.
72-0422
Housley, E.
72-0526
Howard, S.F.
72-0301
72-0389
Howells, D.J.
72-0046
72-0375
Huehne, W.H.
72-0015
Hueper, W.C.
72-0335
Hughes, L.B.
72-0456
Huizinga, T.
72-0104
Humphries, M.
72-0504
Hunter, R.C.
72-0195
Hutson, D.H.
72-0583
Hutzinger, O.
72-0460
Hylin, J.W.
72-0220
Hyodo, K.
72-0530
72-0531
72-0586
72-0587

Ichikawa, H.
72-0569
Ikeda, M.
72-0592
72-0593
Ikramov, L.T.
72-0208
Imaizumi, K.
72-0517
Isensee, A.R.
72-0273
Ishii, K.
72-0517
Ishikawa, T.
72-0084
Ivanova-Chemishanska, L.
72-0558
Ivey, M.C.
72-0411
Iwasaki, I.
72-0530
72-0531
72-0586
72-0587

Izumiyama, T.
72-0514

Jackson, L.P.
72-0043
Jackson, M.D.
72-0170
72-0296
72-0494
Jakl, A.
72-0361
72-0590
Janes, N.F.
72-0471
Janicki, R.H.
72-0135
72-0153
Jayaram, M.
72-0408
72-0421
Jefferies, D.J.
72-0599
72-0656
Jennings, D.M.
72-0113
Jenny, E.
72-0555
Jeppson, L.R.
72-0271
Johansson, H.
72-0241
Johnsen, R.E.
72-0263
72-0638
Johnson, B.T.
72-0175
Johnson, H.A.
72-0246
Johnson, J.E.
72-0092
Johnson, L.G.
72-0278
72-0326
Johnson, M.K.
72-0146
Jolliffe, V.A.
72-0462
Jones, F.J.S.
72-0113
Jones, G.E.
72-0273
Jones, O.R.
72-0286
Jordan, C.
72-0412
Jordan, P.D.
72-0053

Jovic, R.
72-0620
Jukes, T.H.
72-0014
72-0423
Jung, H.D.
72-0550
Juul Christensen, E.K.
72-0104

Kaars Sijpesteijn, A.
72-0055
72-0112
Kagan, Y.C.
72-0518
Kagan, Yu. G.
72-0183
Kaloyanova-Simeonova, F.
72-0509
Kamata, K.
72-0514
Kambe, Y.
72-0516
Kaneda, Y.
72-0473
72-0474
Kanki, T.
72-0594
Kapeller, K.
72-0565
Kapoor, I.P.
72-0151
72-0577
Karasek, F.W.
72-0635
Karasz, A.B.
72-0383
Karlog, O.
72-0482
Karlsson, L.
72-0521
Karstad, L.
72-0178
Kasai, A.
72-0451
Kasamatsu, S.
72-0570
Kawai, M.
72-0510
Kawano, Y.
72-0220
Kawatski, J.A.
72-0064
Kaykaty, M.
72-0381
Kazhdan, V.B.
72-0158

Kearney, P.C.
72-0486
Kearns, C.W.
72-0121
Kedar, E.
72-0613
Keith, L.H.
72-0225
Kelperis, J.
72-0069
Kennard, C.H.L.
72-0636
Kennedy, M.V.
72-0294
72-0295
72-0333
Kennedy, W.P.U.
72-0526
Kerner, E.
72-0418
Khaikina, B.I.
72-0182
Khan, M.A.
72-0349
Khan, M.A.Q.
72-0352
Khandekar, J.D.
72-0097
Khasanov, V. Kh.
72-0323
Khunen, H.
72-0119
Kiermeier, F.
72-0650
Kiesling, R.L.
72-0009
Kiigemagi, U.
72-0077
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Kinoshita, F.K.
72-0376
Kinter, W.B.
72-0135
72-0153
Kirsch, E.J.
72-0227
Klein, D.A.
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Kleinschmidt, M.G.
72-0272
Kling, R.C.
72-0036
Klingebiel, U.I.
72-0310
Klisenko, M.A.
72-0305
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Klitsch, F.E.
72-0427
Knaak, J.B.
72-0140
Knaggs, F.W.
72-0061
Knapp, J.C.F.
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Knowles, C.O.
72-0026
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Ko, W.-H.
72-0188
Koch, R.B.
72-0376
Kochanova, A.P.
72-0158
Koeman, J.H.
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Koeniger, M.
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Koessler, F.
72-0414
Kohegyi, I.
72-0315
Kolesnichenko, T.S.
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Kolipinski, M.C.
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Komisarenko, V.P.
72-0595
Kono, S.
72-0514
Konrad, J.G.
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Kontek, M.
72-0336
Koo, F.K.S.
72-0468
Koos, B.A.
72-0382
Korschgen, L.J.
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Kosaba, S.
72-0212
Kotakemori, M.
72-0214
Kovac, J.
72-0373
Kratky, B.A.
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Kraul, I.
72-0482
Kreitzer, J.F.
72-0100
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Kroeller, E.
72-0226
Krueger, H.R.
72-0297
Kubena, L.F.
72-0615
Kubo, M.
72-0212
Kuhnen, H.
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Kundiev, U.I.
72-0508
Kunz, S.E.
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Kupfer, D.
72-0362
Kuroume, T.
72-0516
Kurti, M.
72-0377
Kuyama, S.
72-0211
Kuzminskaya, V.A.
72-0202
Kvitnitskaya, V.A.
72-0193
Kwalick, D.S.
72-0085
Kwiatkowski, M.
72-0328

Lacomba, J.R.
72-0527
Lahav, M.
72-0606
Lal, R.
72-0276
Lambert, S.M.
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Landis, B.J.
72-0495
Lapchenko, V.S.
72-0306
Lascari, A.D.
72-0131
Laubscher, J.A.
72-0261
Lawton, R.L.
72-0326
Le Boeuf, B.J.
72-0308
Leary, J.B.
72-0393
Lech, J.J.
72-0605
Lee, G.F.
72-0314
Lee, S.S.
72-0387
Leenheer, J.A.
72-0503
Lefar, M.S.
72-0380
Legator, M.S.
72-0445
Lehmann, H.J.
72-0597
Lemperle, E.
72-0418
Lenhard, A.A.
72-0553
Leoni, V.
72-0401
72-0658
Leuck, D.B.
72-0274
Leuzinger, S.
72-0552
Levi-Minzi, R.
72-0072
Li, M.F.
72-0412
Libke, K.G.
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Lichtenstein, E.P.
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Liebig, Jr., G.F.
72-0392
Likosky, W.H.
72-0536
Lilley, S.
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Linder, R.L.
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Lipscomb, G.Q.
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Lisk, D.J.
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Litvinov, H.H.
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Liu, L.C.
72-0079
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Lloyd, D.C.
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Lloyd, Jr., E.H.
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Locke, R.K.
72-0357
Lockwood, J.L.
72-0188
Loftis, C.D.
72-0644
Long, J.P.
72-0167
Long, K.R.
72-0083
72-0449
72-0549

Longcore, J.R.
72-0206
72-0351
Longley, E.O.
72-0507
Lotocki, W.
72-0532
Lowe, J.I.
72-0370
Lu, K.C.
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Lu, P.-Y.
72-0577
Lucier, G.W.
72-0154
72-0358
72-0359
Luedemann, D.
72-0160
Lundy, A.M.
72-0173
Lutz, J.F.
72-0049
Lyubenko, P.A.
72-0518

Mac Donald, A.
72-0381
Machin, A.F.
72-0471
MacIver, D.R.
72-0253
Madaric, A.
72-0407
72-0448
Madel, W.
72-0002
Mahmood, G.
72-0259
Mahmoud, S.A.Z.
72-0574
Majumder, S.K.
72-0408
72-0647
Makita, T.
72-0565
Malkomes, H.P.
72-0291
Mamyan, D.B.
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Maniko, N.N.
72-0518
Mankau, R.
72-0292
Marcinkowska, B.
72-0336
Marganian, V.M.
72-0334
Markina, V.B.
72-0158
Markov, D.V.
72-0558
Marrow, Jr., G.S.
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Martens, P.
72-0481
Martens, P.H.
72-0313
Martin, A.
72-0608
Martin, N.
72-0440
Marxmiller, R.L.
72-0382
Maslii, L.K.
72-0158
Mathers, A.C.
72-0286
Mathre, D.E.
72-0125
72-0379
Matsumura, F.
72-0277
72-0347
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Matsushima, S.
72-0511
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Matthew, H.
72-0526
Matthews, H.B.
72-0154
72-0358
Matyushina, V.I.
72-0518
Mazzoni, S.
72-0228
McBride, B.C.
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McConnell, E.E.
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McCutchen, L.R.
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McDaniel, O.S.
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McDonough, L.M.
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McDowell, L.L.
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McHardy, G.J.R.
72-0526
McKercher, R.B.
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McKinney, J.D.
72-0225
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McKone, C.E.
72-0070
McLane, M.A.R.
72-0260
McLeod, J.G.
72-0522
McNew, G.L.
72-0235
McParland, P.J.
72-0322
Medovar, A.M.
72-0110
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72-0518
Meehan, W.R.
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Meeter, E.
72-0145
Mehendale, H.M.
72-0463
Meinard, C.
72-0417
Melinte, C.
72-0287
Mendoza, E.E.
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Menzer, R.E.
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Merkin, T.
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Mestitzova, M.
72-0373
Mestres, R.
72-0489
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Metcalf, R.L.
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Meyer, R.E.
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Mick, D.L.
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Mickleson, K.N.P.
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Mihail, G.
72-0519
Mihaila, D.
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Mikosha, O.S.
72-0595
Miles, J.R.W.
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Miller, G.W.
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Minne, J.A.
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Mironov, Ye. P.
72-0547
Mishra, R.C.
72-0410
Misra, K.C.
72-0205
Misra, S.S.
72-0276
72-0298
Mita, K.
72-0517
Mitchell, J.E.
72-0032
Mitich, L.W.
72-0016
Miyamato, J.
72-0420
Miyamoto, J.
72-0210
Miyata, T.
72-0580
Mochida, K.
72-0473
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Moellhoff, E.
72-0047
Molnar, P.
72-0315
Montgomery, M.L.
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72-0282
Moore, N.W.
72-0020
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Morales, J.
72-0608
Morello, A.
72-0348
Mori, T.
72-0565
Moriarty, F.
72-0539
Morley, H.B.
72-0040
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Morris, R.L.
72-0278
72-0326
Moss, J.A.
72-0583

Mosser, J.L.
72-0467
Motohashi, N.
72-0450
Mounce, L.
72-0087
Mozai, T.
72-0086
Muller, H.D.
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Mullins, D.E.
72-0263
Munson, J.D.
72-0200
Murai, T.
72-0029
Murano, A.
72-0420
Murayama, K.
72-0224
Muro, T.
72-0086
Murphy, J.V.
72-0346
Murphy, P.G.
72-0229
72-0346
Muthu, M.
72-0647

Nagamine, A.
72-0210
Nagasawa, S.
72-0159
Nagata, H.
72-0514
Nagy, M.
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Naik, M.N.
72-0293
Nakada, Y.
72-0224
Nakamura, S.
72-0211
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72-0517
Nalewaja, J.D.
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Namba, M.
72-0531
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Namba, T.
72-0090
Narahashi, T.
72-0124
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Natoff, I.L.
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Naumann, K.
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Nawa, H.
72-0530
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Neill, D.D.
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Nenner, M.
72-0221
Neogi, A.N.
72-0309
Nesynov, Ye. P.
72-0109
Nesynova, L.I.
72-0109
Newman, J.F.
72-0061
Newsom, L.D.
72-0324
Newsome, J.D.
72-0260
Nicaise, C.
72-0548
Niedzielska-Sosnierz, H.
72-0128
Niehuss, M.
72-0290
Nikonova, A.G.
72-0340
Nishibe, T.
72-0565
Noguchi, M.
72-0473
72-0474
Noguchi, T.
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Nomura, S.
72-0515
Nose, K.
72-0028
Novozhilov, K.V.
72-0419
Novaczyk, W.
72-0283
Nowak, W.
72-0532
Nystrom, R.F.
72-0577

O'Neal, J.R.
72-0464
Obayashi, K.
72-0214
Ogata, J.N.
72-0220
72-0416
Ogawa, T.
72-0213
Ogilvie, S.Y.
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Ohkawa, H.
72-0123
Oka, Y.
72-0210
Okuda, T.
72-0652
Oldiges, H.
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Olney, C.E.
72-0249
Oloffs, P.C.
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Olsen, S.R.
72-0484
Onley, J.H.
72-0301
72-0388
Osipian, V.T.
72-0158
Ott, D.E.
72-0392
Otto, S.
72-0479
Ozhovan, M.V.
72-0179

Panshina, T.N.
72-0518
Paoletti, A.
72-0023
Papadopolou, C.
72-0069
Pape, B.E.
72-0268
Pardini, R.S.
72-0353
72-0614
Parsons, D.A.
72-0058
Pasi, A.
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Pass, B.C.
72-0461
Passlow, T.
72-0469
Patocka, J.
72-0585
72-0590
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Patric, J.H.
72-0446
Paulson, G.D.
72-0581
Payne, B.
72-0614
Pearl, W.
72-0362
Peart, A.J.
72-0607
Pease, H.L.
72-0394
Pekas, J.C.
72-0129
Pels, E.
72-0540
Pendleton, R.F.
72-0425
Pennings, J.H.
72-0366
Persson, B.
72-0198
Peterle, A.F.
72-0612
Peterle, T.J.
72-0612
Peyron, L.
72-0289
Phelps, L.D.
72-0494
Phillips, W.E.J.
72-0350
Philpot, R.M.
72-0164
72-0339
Pichirallo, J.
72-0018
Pickering, B.A.
72-0583
Pierce, Jr., R.H.
72-0249
Pietraszek, Z.
72-0336
Pitois, M.
72-0048
72-0080
Pizzingrilli, G.
72-0642
Plapp, R.
72-0454
Platonow, N.S.
72-0316
Plestina, R.
72-0144
Plimmer, J.R.
72-0310
Pocker, Y.
72-0561
Pokorny, J.
72-0563
Politykhin, A. Ya.
72-0184

Pomonis, J.G.
72-0223
Ponti, I.
72-0073
Porter, M.L.
72-0395
Post, L.C.
72-0343
Prescott, L.F.
72-0526
Price, M.A.
72-0575
Priode, B.M.
72-0176
Prospero, J.M.
72-0478
Protos, E.
72-0342
Prouty, R.M.
72-0329
Pryde, P.R.
72-0237
Puccetti, G.
72-0658
Pugh, D.M.
72-0134

Quaif, M.L.
72-0118
Quick, M.P.
72-0471

Rachmilewitz, M.
72-0554
Radeleff, R.D.
72-0575
Radice, M.
72-0642
Radomanski, T.
72-0533
Radomski, J.L.
72-0365
72-0557
Ragab, M.T.H.
72-0043
Ragland, W.L.
72-0186
Raheja, K.L.
72-0168
Rakickas, M.E.
72-0279
Ramarao, G.
72-0371
Ramsteiner, K.
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Rankin, P.C.
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Ravina, A.
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Raymond, D.G.M.
72-0056
Razeghi, N.
72-0330
Reber, E.F.
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Regan, M.
72-0322
Regnier, Jr., A.V.
72-0527
Reich, G.A.
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Reiff, B.
72-0165
Reinart, R.
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Reiner, E.
72-0139
Reinke, J.
72-0633
Reist, W.
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van Rensburg, I.B.J.
72-0645
Rey, A.
72-0222
Rey, A.A.
72-0365
72-0557
Ribelin, W.E.
72-0091
Richards, B.D.
72-0195
Richardson, E.M.
72-0483
Richardson, G.V.
72-0197
Riley, T.E.
72-0054
Riner, J.C.
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Ringer, R.K.
72-0312
Rioux, J.A.
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Roan, C.C.
72-0261
Robertson, Jr., E.A.
72-0062
Robinson, J.
72-0600
Robson, J.S.
72-0526
Rodionov, G.A.
72-0518
Rodler, I.
72-0315
Rogers, W.N.
72-0544
Roll, R.
72-0617
Romann, E.
72-0538
Rosales, J.
72-0207
Rosefield, I.
72-0106
Rosen, E.
72-0521
Rosen, J.D.
72-0497
Rosival, L.
72-0448
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Rote, J.W.
72-0229
Rotini, O.T.
72-0072
Ruano, C.
72-0608
Rucker, G.
72-0651
Rudi, G.G.
72-0568
Rumsey, T.S.
72-0197
Ryan, A.J.
72-0342

Sackmauerova, M.
72-0407
Safe, S.
72-0460
Salcedo, R.N.
72-0011
Samson, F.B.
72-0206
72-0351
Sand, P.F.
72-0038
Sanders, H.O.
72-0175
Sandi, E.
72-0093
Sans, W.W.
72-0262
Santi, R.
72-0642
Santolucito, J.A.
72-0116
Sarig, S.
72-0606
Saschenbrecker, P.W.
72-0316
Sasinovich, L.M.
72-0183
72-0518
Saunders, C.R.
72-0175
Savage, E.P.
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Saxena, P.K.
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Schilling, P.
72-0413
Schmedding, D.
72-0161
Schmidlin-Meszaros, J.
72-0538
Schmulbach, J.C.
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Schneider, A.D.
72-0286
Schoof, H.F.
72-0527
Schuette, H.R.
72-0185
Schultz, D.P.
72-0458
Schultz, D.R.
72-0382
Schulz, D.
72-0127
Schulz, K.R.
72-0037
Schutzmann, R.L.
72-0038
Schweizer, E.E.
72-0317
Scifres, C.J.
72-0285
Scott, H.D.
72-0049
Seagran, H.L.
72-0312
Sears, H.S.
72-0094
Seba, D.B.
72-0478
Segawa, M.
72-0084
Selim, K.G.
72-0574
Serrano Gonzalvez, L.
72-0074
Seutin, E.
72-0493
Severi, G.
72-0060

Severson, K.E.
72-0199
Severson, R.F.
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Sheahan, B.J.
72-0134
Sheets, T.J.
72-0170
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Shigematsu, H.
72-0594
Shilina, V.F.
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Shimada, Y.
72-0086
Shimizu, H.
72-0212
Shindy, W.W.
72-0462
Shmigidina, A.M.
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Shtenberg, A.I.
72-0179
Shuman, Jr., F.L.
72-0294
72-0295
72-0333
Shupe, J.L.
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Shutze, J.V.
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Sidell, F.R.
72-0196
Siegel, M.R.
72-0120
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Siewierski, M.
72-0497
Simkin, A.Z.
72-0547
Simmonds, F.J.
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Simon, G.
72-0372
Simona, A.
72-0287
Simpson, G.R.
72-0507
Sims, J.J.
72-0216
Sinegre, G.
72-0492
Singh, J.
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Sink, J.D.
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Sisken, H.R.
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Sissons, D.
72-0219
Sitzman, F.C.
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Skrentny, R.F.
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Sladek, N.E.
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Smirnova, S.N.
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Smith, A.E.
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Smith, L.W.
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72-0355
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Snow, D.H.
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Snyder, D.
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Sobotka, T.
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Soedergren, A.
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Sokic, B.
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Sonawane, B.R.
72-0026
Sos, J.
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Spann, J.W.
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Spencer, D.L.
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Spencer, W.F.
72-0257
Srebocan, V.
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St. John, L.
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St. John, Jr., L.E.
72-0360
Stach, R.
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Stadelmann, W.
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Stasiewicz, A.
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Stathopoulos, D.G.
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Stec, J.
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Stecko, V.
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Stephenson, G.R.
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Sterling, T.D.
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Stewart, D.K.R.
72-0302
Stickel, L.F.
72-0260
Stojanovic, B.J.
72-0294
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Stokinger, H.E.
72-0252
Stovell, F.R.
72-0001
Strik, J.J.T.W.A.
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Strother, A.
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Stull, J.W.
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Su. M.-Q.
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Suffet, I.H.
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Sugaya, T.
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Sugimoto, Y.
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Sugiyama, H.
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Sullivan, D.
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Sunner, M.
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Suwa, K.
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Swan, A.A.B.
72-0526
Szelenyi, I.
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Szilagyi, I.
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Szokolay, A.
72-0407
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Szrzedzinski, J.
72-0532

Tachikawa, R.
72-0304
Tachmann, W.
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Takagi, S.
72-0530
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Takamatsu, M.
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72-0517
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Tanaka, T.
72-0029
Tarakhovskiy, M.L.
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Tarrant, R.F.
72-0059
Tashpulatov, A. Yu.
72-0208
Tatsukawa, R.
72-0212
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Telegina, K.A.
72-0082
Teng, T.-C.
72-0467
Terranova, A.C.
72-0223
Terriere, L.C.
72-0077
72-0078

Tessari, J.D.
72-0390
Tetenyi, P.
72-0652
Thiemann, K.-G.
72-0535
Thomason, I.J.
72-0292
Thompson, F.B.
72-0242
72-0243
72-0244
72-0245
Thompson, R.H.
72-0322
Thorpe, E.
72-0600
Tierney, D.F.
72-0572
Tikhonova, G. P.
72-0203
Timoshenko, Ya. G.
72-0156
Tinsley, I.J.
72-0161
Tomann, A.
72-0470
Tomatis, L.
72-0567
Torgeson, D.C.
72-0234
Toriumi, T.
72-0592
72-0593
Trabka, J.
72-0364
Trainer, D.O.
72-0186
Trebicka-Kwiatkowska, B.
72-0533
Triolo, A.J.
72-0181
Trombetti, G.
72-0649
Truhaut, R.
72-0288
Tsuda, H.
72-0211
Tucker, R.K.
72-0117
Tuinstra, L.G.M. Th.
72-0403
Tulach, J.
72-0361
72-0590
Tweedy, B.G.
72-0458
Ueda, K.
72-0031
72-0240
72-0510
Uehara, K.
72-0237
Uhnak, J.
72-0407
72-0448
Unai, T.
72-0123
Uono, M.
72-0084
Urakawa, N.
72-0592
Ushio, K.
72-0237
Utagawa, T.
72-0025
Uthe, J.F.
72-0633
Utley, D.
72-0046
Van Steyvoort, L.
72-0313
Vanat, I.M.
72-0546
Vanat, S.V.
72-0546
Vandekar, M.
72-0144
Varela-Alvarez, H.
72-0578
Vashkov, V.I.
72-0158
Veith, G.D.
72-0314
Vekshtein, M. Sh.
72-0305
Velazquez, C.
72-0527
Verblyudova, N.I.
72-0653
Verma, S.
72-0276
72-0298
Vernik, A. Ya.
72-0543
Viets, F.G.
72-0485
Vigliani, E.C.
72-0551
Vigovskaya, L.I.
72-0518
Villeneuve, D.C.
72-0350
72-0624
Visweswariah, K.
72-0408
72-0421
Vojvodic, V.
72-0620
Volkova, V.A.
72-0419
Vonk, J.W.
72-0055
72-0112
Vorob'eva, N.M.
72-0306
Vos, J.G.
72-0366
Vukovich, R.A.
72-0181
Waggoner, T.B.
72-0643
Waite, G.K.
72-0469
Wakimoto, T.
72-0213
Walker, A.I.T.
72-0600
Walker, L.L.
72-0239
Walker, P.T.
72-0488
Wall, Jr., W.J.
72-0334
Wallace, J.B.
72-0267
Wallnoefer, P.R.
72-0454
72-0460
Walls, R.E.
72-0250
Walton, M.S.
72-0115
Wangenheim, M.
72-0555
Ware, G.W.
72-0264
72-0279
Wassermann, D.
72-0506
72-0613
Wassermann, M.
72-0506
72-0613
Watanabe, S.
72-0566
Watanobe, S.
72-0512
Watson, D.F.
72-0602
Watson, M.
72-0099
Way, J.M.
72-0061
Webster, J.M.
72-0256
Wedemeyer, G.A.
72-0562
72-0603
Wehr, N.B.
72-0172
Weisburger, E.K.
72-0171
Weisburger, J.H.
72-0171
Wells, M.R.
72-0579
Welti, D.
72-0219
Westing, A.H.
72-0424
72-0007
Westlake, W.E.
72-0271
72-0464
72-0626
Weyant, J.R.
72-0616
Wheeler, L.
72-0180
Whitcomb, E.
72-0116
Whiteoak, R.J.
72-0405
Whiting, F.M.
72-0281
Whittendale, Jr., T.W.
72-0351
Widmark, G.
72-0622
Wiersma, G.B.
72-0038
Wiese, A.F.
72-0286
Whilhelm, A.
72-0535
Wilhelm, K.
72-0144
Wilkins, R.M.
72-0309
Williams, C.H.
72-0345
Williams, C.S.
72-0447
Williams, D.T.
72-0396

Williams, Jr., L.P.
72-0087
Williams, P.P.
72-0356
Wilson, Jr., A.J.
72-0370
72-0339
Wilson, P.D.
72-0370
Winstanley, E.W.
72-0134
Wiseman, J.S.
72-0280
72-0499
Wolburg, I.
72-0414
Wolfe, C.W.
72-0200
Wolfe, R.S.
72-0576
Wolff, F.
72-0550
Wolthuis, O.L.
72-0145
Wood, W.
72-0099
Woodham, D.W.
72-0644
Woodwell, G.M.
72-0246
Woolson, E.A.
72-0486
Wrenn, T. R.
72-0616
Wrich, M.J.
72-0368
Wright, F.C.
72-0459
Wright, N.
72-0526
Wurster, C.F.
72-0467
Wurzinger, K.-H.
72-0191
Wynder, E.L.
72-0132

Yamamoto, I.
72-0123
72-0149
Yamamoto, R.S.
72-0171
Yamaoka, K.
72-0214
Yamazaki, I.
72-0212
Yanase, R.
72-0212
Yap, H.H.
72-0376
Yarbrough, J.D.
72-0579
Yates, M.L.
72-0265
Yip, G.
72-0301
72-0388
72-0389
Yokawa, Y.
72-0212
Yoshida, M.
72-0441
Yoshida, T.
72-0269
Yoshimura, K.
72-0473
72-0474
Yoshino, Y.
72-0086
Youatt, W.G.
72-0312
Young, R.G.
72-0190
Younger, R.L.
72-0459
Yu, C.-C.
72-0121
72-0133
Yu, T.C.
72-0282
Yule, M.N.
72-0075
Yura, Y.
72-0224

Zabik, M.J.
72-0268
Zamfir, Gh.
72-0287
Zaslow, I.M.
72-0553
Zaylskie, R.G.
72-0223
72-0581
Zehr, M.V.
72-0581
Zenon-Roland, L.
72-0313
72-0481
72-0493
Zerbe, J.
72-0283
Zitko, V.
72-0218
72-0500
Zlavog, A.
72-0159
Zoch, E.
72-0609
Zoledziowska, J.
72-0328
Zorin, P.M.
72-0545

AUTHOR INDEX

II. CORPORATE AUTHOR INDEX

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